Table III A-3 Routine QA/QC Reporting Requirements for SW-846 Method 6010B

Parameter	Required Analytical Deliverable
Initial Calibration	***NO***
Initial Calibration Verification (ICV)	***NO***
Initial Calibration Blank (ICB)	***NO***
Low Level Calibration Check standard	***NO***
Continuing Calibration Verification (CCV)	***NO***
Continuing Calibration Blank (CCB)	***NO***
Interference Check Standards (ICS A and B)	***NO***
Method (Preparation) Blank	***YES***
Laboratory Control Samples (LCS)	***YES***
LCS Duplicate (or project-specific MD or MSD)	***YES***
Project-specific Matrix Spike Sample (MS)	***YES, only if requested by the LSP***
Project-specific Matrix Duplicate (MD)	***YES, only if requested by the LSP***
Project-specific Matrix Spike Duplicate (MSD)	***YES, only if requested by the LSP***
Linear Range Analysis	***NO***
Inter-element Spectral Interference Correction Analysis	***NO***
General Reporting – sample specific reporting limits	***YES***

4.0 Regulatory Limits for Metals under 310 CMR 40.000

The most stringent (lowest) MCP Reportable Concentrations (RCs) and Method 1 Standards for metals analyzable by SW-846 Method 6010B are as follows:

Metal	RQ Pounds	RC GW-1 mg/L - (ppm)	RC S-1 mg/kg - (ppm)	Method 1 Groundwater *ug*/L - ppb	Method 1 Soils *ug*/g - ppm
Antimony	50	0.006	10	6	10
Arsenic	1	0.05	30	50	30
Barium	100	2	1000	2000	1000
Beryllium	5	0.004	0.7	4	0.7
Cadmium	5	0.005	30	5	30
Chromium (III)	100	0.1	1000	100	1000
Chromium (VI)	100	0.1	1000	50	200
Cobalt	50	5	500	NS	NS
Copper	100	10	1000	NS	NS
Lead	5	0.02	300	15	300
Lithium	10	1	100	NS	NS
Mercury[1]	1	0.001	20	2	20
Nickel	10	0.08	300	80 (GW-3)	300
Phosphorous	1	NA	NA	NS	NS
Potassium	10	NA	NA	NS	NS
Selenium	10	0.05	400	50	400
Silver	50	0.007	100	7 (GW-3)	100
Sodium	5	NA	NA	NS	NS
Thallium	50	0.002	8	2	8
Vanadium	50	0.05	400	50	400
Zinc	50	0.9	2500	900 (GW-3)	2500

NA – Not Applicable
RQ – Reportable Quantity
RC – Reportable Concentration for Groundwater (GW-1) and Soils (S-1)
Method 1 Groundwater – GW-1 Category unless otherwise noted
Method 1 Soils – Category S-1/GW-1 in all cases
NS – No MCP Method 1 Standard has been promulgated by the Department.
1 Mercury values presented for completeness only. Analyze mercury by SW-846 Methods 7470A and 7471

Sample preservation, container and analytical holding time specifications for surface water, groundwater, soil, sediment and wastes matrices for metal analyses conducted in support of MCP decision-making are summarized below and presented in Appendix VII-A of WSC-CAM-VIIA, Quality Assurance and Quality Control Guidelines for Sampling, Data Evaluation, and Reporting Activities for the Massachusetts Contingency Plan (MCP). Additional guidance may be found in SW-846, Chapter Three

Matrix	Sample Container(s) [1]	Preservative	Holding Time [2]
Total Metals Groundwater and Surface Water	(1) 1-L Polyethylene Bottle for Total Metals	HNO_3 to pH < 2,	180 days: all metals except mercury 28 days: mercury
Dissolved Metals Groundwater and Surface Water	(1) 1-L Polyethylene Bottle for field-filtered sample for Dissolved Metals	Filter (0.45 µm) unpreserved sample on site; or at the laboratory ***(prior to acid preservation)*** within 24 hours of collection, then HNO_3 to pH <2,	180 days: all metals except mercury 28 days: mercury
Suspended Metals Groundwater and Surface Water	Submit Suspended Solids on Filter to Laboratory	Filter on site Filter 100 – 500 ml of unpreserved sample	180 days: all metals except mercury 28 days: mercury
Soils and Sediments	(1) 4-ounce glass jar	Cool, 4°C	180 days: all metals except mercury 28 days: mercury
Concentrated Waste Samples	125 mL wide mouth glass or plastic	Cool to 4°C	180 days: all metals except mercury 28 days: mercury

1 The number of sampling containers specified is not a requirement. For specific analyses, the collection of multiple sample containers is encouraged to avoid resampling if sample is consumed or compromised.

2 From date of sample collection.

SW-846 Method	Method Description
3005	Method prepares ground water and surface water samples for total recoverable and dissolved metal determinations by FLAA, ICP-AES, or ICP-MS. The unfiltered or filtered sample is heated with dilute HCl and HNO prior to metal determination.
3010	Method prepares waste samples for total recoverable metal determinations by FLAA, ICPAES, or ICP-MS. The samples are vigorously digested with nitric acid followed by dilution with hydrochloric acid. The method is applicable to aqueous samples, EP and mobility-procedure extracts.
3015	Method prepares aqueous samples, mobility-procedure extracts, and wastes that contain suspended solids for total recoverable metal determinations by FLAA, GFAA, ICP-AES, or ICP-MS. Nitric acid is added to the sample in a Teflon digestion vessel and heated in a microwave unit prior to metals determination.
3031	Method prepares waste oils, oil sludges, tars, waxes, paints, paint sludges and other viscous petroleum products for analysis by FLAA, GFAA, and ICP-AES. The samples are vigorously digested with nitric acid, sulfuric acid, hydrochloric acid, and potassium permanganate prior to analysis.
3040	Method prepares oily waste samples for determination of soluble metals by FLAA, GFAA, and ICP-AES methods. The samples are dissolved and diluted in organic solvent prior to analysis. The method is applicable to the organic extract in the oily waste EP procedure and other samples high in oil, grease, or wax content
3050	Method prepares waste samples for total recoverable metals determinations by FLAA and ICP-AES, or GFAA and ICP-MS depending on the options chosen. The samples are vigorously digested in nitric acid and hydrogen peroxide followed by dilution with either nitric or hydrochloric acid. The method is applicable to soils, sludges, and solid waste samples.
3051	Method prepares sludges, sediments, soils and oils for total recoverable metal determinations by FLAA, GFAA, ICP-AES or ICP-MS. Nitric acid is added to the representative sample in a fluorocarbon digestion vessel and heated in a microwave unit prior to metals determination.
3052	Method prepares siliceous and organically based matrices including ash, biological tissue, oil, oil contaminated soil, sediment, sludge, and soil for total analysis by FLAA, CVAA, GFAA, ICPAES, and ICP-MS. Nitric acid and hydrofluoric acid are added to a representative sample in a fluorocarbon digestion vessel and heated in a microwave unit prior to analysis

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11/4/04

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
CAM 17 GFAA or ICP/MS in Soil (EPA 7000)								
Preservation: Store cool at 4°C								
Container: 8 oz. jar		**Amount Required:** 10 g				**Hold Time:** 180 days		
Arsenic	0.036	0.25 mg/kg			75 - 125	30	75 - 125	25
Lead		0.25 mg/kg			75 - 125	30	75 - 125	25
Selenium	0.097	0.25 mg/kg			75 - 125	30	75 - 125	25
Thallium	0.059	0.25 mg/kg			75 - 125	30	75 - 125	25
CAM 17 ICP in Soil (EPA 6010B)								
Preservation: Store cool at 4°C								
Container: 8 oz. jar		**Amount Required:** 500 mL				**Hold Time:** 180 days		
Antimony	2.0	2.5 mg/kg			75 - 125	30	75 - 125	25
Barium	0.57	1.0 mg/kg			75 - 125	30	75 - 125	25
Beryllium	0.050	0.50 mg/kg			75 - 125	30	75 - 125	25
Cadmium	0.15	0.50 mg/kg			75 - 125	30	75 - 125	25
Cobalt	0.080	1.0 mg/kg			75 - 125	30	75 - 125	25
Chromium	0.31	1.0 mg/kg			75 - 125	30	75 - 125	25
Copper	0.30	1.0 mg/kg			75 - 125	30	75 - 125	25
Lead	0.87	2.5 mg/kg			75 - 125	30	75 - 125	25
Molybdenum	0.24	1.0 mg/kg			75 - 125	30	75 - 125	25
Nickel	0.21	1.0 mg/kg			75 - 125	30	75 - 125	25
Silver	0.18	0.50 mg/kg			75 - 125	30	75 - 125	25
Vanadium	0.090	1.0 mg/kg			75 - 125	30	75 - 125	25
Zinc	0.27	1.0 mg/kg			75 - 125	30	75 - 125	25
Arsenic	0.85	10 mg/kg			75 - 125	30	75 - 125	25
Mercury, CAM17 in Soil (EPA 7471A)								
Preservation: Store cool at 4°C								
Container: 8 oz. jar		**Amount Required:** 10 g				**Hold Time:** 28 days		
Mercury		0.10 mg/kg			75 - 125	25	75 - 125	25

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STANDARD OPERATING PROCEDURES
APPROVAL FORM

EPA Method:	6010B	Revision No.:	6010B-4
Title of SOP:	Inductively Coupled Plasma-Atomic Emission Spectrometry	Revision Date:	November 19, 2002
Author:	Charles Semuas, Richard Kelso	Replaces No.:	6010B-2
Author's Title:	QA/QC Mgr.	Dated:	July 17, 2000

The following people have reviewed this Standard Operating Procedure (SOP) and have recommended its approval.

Signature and Title:

SOP Author	Date
Department Manager Review	Date
QA/QC Manager Approval	Date
Laboratory Director Approval	Date

Periodic Review:

Signature	Title	Date

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1.0 SCOPE AND APPLICATION

1.1 Inductively coupled plasma-atomic emission spectroscopy (ICP) determines trace elements, including metals, in solution. The method is applicable to all of the elements listed in Table 3. All matrices, including ground water, aqueous samples, TCLP and EP extracts, industrial and organic wastes, soils, sludges, sediments, and other solid wastes, require digestion prior to analysis.

1.2 Elements for which Method 6010A is applicable are listed in Table 3. Detection limits, sensitivity, and optimum ranges of the metals will vary with the matrices and model of spectrometer. Use of this method is restricted to spectroscopists who are knowledgeable in the correction of spectral, chemical, and physical interferences.

2.0 METHOD SUMMARY

2.1 Prior to analysis, samples must be solubilized or digested using appropriate sample preparation methods (e.g. Methods 3005A-3050A). When analyzing for dissolved constituents, acid digestion is not necessary if the samples are filtered and acid preserved prior to analysis.

2.2 Method 6010B describes the simultaneous, or sequential, multi-elemental determination of elements by ICP. The method measures element-emitted light by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific atomic-line emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the lines are monitored by photomultiplier tubes. Background correction is required for trace element determination. Background must be measured adjacent to analyte lines on samples during analysis. The position selected for the background-intensity measurement, on either or both sides of the analytical line, will be determined by the complexity of the spectrum adjacent to the analyte line. The position used must be free of spectral interference and reflect the same change in background intensity as occurs at the analyte wavelength measured.

Background photo-multiplier-correction is not required in cases of line broadening where a background correction measurement would actually degrade the analytical result.

3.0 DEFINITIONS

3.1 Laboratory Duplicates (LD1 and LD2) -- Two sample aliquots taken in the analytical laboratory and analyzed separately with identical procedures. Analyses of LD1 and LD2 give a measure of the precision associated with laboratory procedures, but not with sample collection, preservation storage procedures.

3.2 Field Duplicates (FD1 and FD2) -- Two separate samples collected at the same time and place under identical circumstances and treated exactly the same throughout field and laboratory procedures. Analyses of FD1 and FD2 give a measure of the precision associated with sample collection, preservation and storage, as well as with laboratory procedures.

3.3 Laboratory Reagent Blank (LRB) *aka* (Method Blank) -- An aliquot of reagent water that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The LRB is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

3.4 Field Reagent Blank (FRB) *aka* (Trip Blank) -- Reagent water placed in a sample container in the laboratory and treated as a sample in all respects, including exposure to sampling site conditions, storage, preservation and all analytical procedures. The purpose of the FRB is to determine if method analytes or other interferences are present in the field environment.

3.5 Laboratory Performance Check Solution (LPC) -- A solution of method analytes, surrogate compounds, and internal standards used to evaluate the performance of the instrument system with respect to a defined set of method criteria.

3.6 Laboratory Fortified Blank (LFB) *aka* (LCS) -- An aliquot of reagent water to which known quantities of the method analytes are added in the laboratory. The LFB is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements at the required method detection limit.

3.7 Laboratory Fortified Sample Matrix (LFM) *aka* (Matrix Spike) -- An aliquot of an environmental sample to which known quantities of the method analytes are added in the laboratory. The LFM is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the LFM corrected for background concentrations.

4.0 HEALTH AND SAFETY

4.1 The toxicity or carcinogenicity of any chemicals present in the sample are not precisely defined by this method. Therefore, to insure your safety and the safety of other co-workers, each sample should be treated as a potential health hazard. Potential exposure must be reduced to the lowest possible level by following these simple rules:

4.1.1 YOU are responsible for your own safety, not your supervisor.

4.1.2 When handling samples, wear glasses, gloves, and lab coat and work with the sample under a hooded area, when applicable.

4.1.3 If you do not know the hazards of the chemical you are working with, then assume that the chemical is highly toxic, and take all precautions to prevent exposure to the chemical. Special attention must be taken to read the MSDS sheet on the chemical prior to using the chemical.

4.1.4 If a chemical is spilled, take all precautions to limit your exposure to the substance and to contain and clean up the spill. If necessary, quarantine the spill area, and warn co-workers of the situation. Notify the Safety Officer immediately of the accident. Refer to The Chemical Hygiene Plan (Section 10).

4.2 Specific Safety Precautions:

4.2.1 Nitric and hydrochloric acids are very corrosive. Wear gloves when handling digestates.

4.2.2 Most standards have high concentrations of many different metal ions in acidic solutions. Wear gloves when handling standards.

4.2.3 The following are suspected carcinogens: Arsenic, Beryllium, Barium, Cadmium, Manganese, and Sodium.

4.3 Material Safety Data Sheets (MSDS): Each analyst is responsible for reading and understanding the MSDS for each chemical reagent he or she works with. If there is any doubt concerning the content of the MSDS or if the MSDS sheet is missing for a particular chemical, contact the Safety Officer promptly.

4.4 Instrumentation Safety Precautions:

4.4.1 Be sure that all exhaust systems are operative before starting the instrument.

4.4.2 Check the waste container frequently to be sure overflow of waste does not occur.

4.4.3 Refer to ICAP instrument operator's manual for specific operating procedures.

5.0 SAMPLE HANDLING AND PRESERVATION

5.1 The recommended container for water samples is polyethylene or glass and for soil samples the recommended container is glass or brass tube. The minimum collection volume for water is 250 mL and minimum collection weight for solids is 10 g.

5.2 Water samples require preservation by nitric acid to a pH of <2. Soil samples are not preserved.

5.3 The holding time for metals (other than mercury) is 180 days. All samples should be stored at 4°C until analyzed.

6.0 INTERFERENCES

6.1 There are three main types of interference effects that can produce inaccuracies in the determination of trace elements, unless they are compensated or removed.

6.1.1 Spectra Types

6.1.1.1 Spectral interferences are caused by the overlap of adjacent spectra lines.

6.1.1.2 Background from continuous or recombination phenomena or stray light from the emission of high concentration elements. This is sometimes called background shifts.

6.1.2 Physical Types

6.1.2.1 Interferences due to surface tension and changes in viscosity can cause inaccurate results.

6.1.3 Chemical Types

6.1.3.1 Interferences due to ionization effects, molecular compound formation and vaporization effects can be present.

6.2 Methods For Compensating or Removing Interferences.

6.2.1 Spectral interferences can be compensated by computer correction of the raw data. Background shifts can be compensated by using the spectrum shifter available with the instrument.

6.2.2 Physical interferences can be compensated for by using a peristaltic pump to deliver the aqueous solution to the nebulizer or by using method of standard additions. The physical interference can sometimes be removed by dilution.

6.3.3 Chemical interferences can be compensated for by matrix matching or method of standard additions.

7.0 APPARATUS AND MATERIALS

7.1 Instrument Configuration

7.1.1 Thermo Jarrell Ash model Enviro 36 Inductively Coupled Plasma Spectrometer with twenty eight element channels.

7.1.2 NEC-286 computer

7.1.3 Computer controlled autosampler

7.1.4 Peristaltic pump, two channel

7.2 Liquid argon is used regularly; however, high pressure argon cylinders are on hand for backup.

7.3 All standards for calibration, quality control checks, and spiking are purchased from commercial vendors. Tables 1, 2, 3, 4,and 5 list the preparation methods.

7.4 An appropriate volume of stock spiking solution is added to a sample prior to digestion. The laboratory check sample is prepared by adding the same amount of spiking solution to a reagent blank. See Table 5.

7.5 All commercial standards when received are given a code and logged into the standard receiving log. The prepared intermediate and working solutions also receive a code and are logged into the standards preparation log. See SOP # QA001, Standards.

8.0 QUALITY CONTROL

8.1 QC types, Frequency, Limits and Corrective Actions:

8.1.1 Initial Calibration Verification (ICV) is performed after calibration but prior to sample analysis and should not deviate by more than 5% of actual true values or corrective action is required. See Table 3 for true values.

8.1.2 Initial Calibration Blank (ICB) is performed after calibration but prior to sample analysis and should not be greater than the reporting limit.

8.1.3 Continuing Calibration Verification (CCV) is performed at a 10% frequency with control limits of ±10% of true value. When results are beyond control limits, reanalyze the CCV once; if it is still beyond control limits, take corrective action. Reanalyze the previous ten samples. See Table 3 for true values.

8.1.4 Continuing Calibration Blank (CCB) is performed at a 10% frequency with control limits of < the reporting limit. When results are beyond control limits, reanalyze the CCB once; if it is still beyond control limits, take corrective action. Reanalyze the previous ten samples.

8.1.5 Interelemental Check Standard (ICSAB) is performed at least twice per eight-hour shift with control limits of ±20% of true value. When results are beyond the control limits, take corrective action. Reanalyze ICSAB. See Table 4.

8.1.6 For CLP run: ICSA, ICSAB, and CRI. Samples should be performed at the beginning and end of the run. There are no control limits determined for CRI.

8.1.7 Preparation Blank (PB) contains all the reagents and goes through the entire sample preparation procedure. The frequency for the PB is one per digestion batch or one per 20 samples with control limits < the reporting limit. When results are beyond the control limits, redigestion may be required.

8.1.8 Laboratory Control Sample (LCS) contains analytes and reagents that go through the entire sample preparation procedure. The frequency for the LCS is one per digestion batch of 20 samples with recovery control limits of ±20% for waters and ±25% for soils. If the analysis of an LCSD is required, then the RPDs must be less than or equal to the control limits. Sample redigestion may be required. See Table 5.

8.1.9 Matrix Spike and Matrix Spike duplicate (MS and MSD) samples are performed at a frequency of one per digestion batch or every twenty samples, whichever is more frequent with advisory recovery control limits of ± 25% for both waters and soils. The RPD should be ±25% for sample values greater than ten times the instrument detection limit.

8.1.10 For CLP only, if both sample and duplicate values are greater than or equal to 5 times CRDL, then the RPD must be less than or equal to 20% to be in control. If either sample or duplicate values are less than 5 times CRDL, then the absolute difference between the two values must be less than the CRDL to be in control. If both values are below the CRDL, then no control limit is applicable.

8.1.11 Post spike and linear dilution will be done according to CLP protocol.

8.2 IDL studies are performed quarterly. MDL studies are performed annually.

8.2.1 MDL's are accomplished by preparing a working solution with element concentrations approximately three to five times the estimated MDL. Seven to ten aliquots of this working solution are handled as if they were samples and taken through the complete digestion and ICP analysis process.

9.0 ANALYTICAL PROCEDURES

9.1 The current instrument settings for TJA ENVIRO 36 are as follows:

Argon Flow to Torch	15 L/min
Auxiliary Argon Flow	0
Argon Sample Flow	0.65 L/min
Peristaltic Pump	800
Forward Power	1.1 KW

The settings above may be changed to improve ICAP performance if necessary.

9.2 See the digestion/extraction SOP's (Methods 3010A and 3050B) for detailed explanations of the various digestion/extraction procedures.

9.3 All standards, QC check samples and samples are loaded onto the autosampler which is controlled by the computer. A peristaltic pump introduces the aqueous digestate into the nebulizer which produces an aerosol inside the spray chamber. This aerosol is brought into the torch by the argon sample flow.

9.4 The analytes are automatically identified by the program software and stored in the data base.

9.5 The analytes are automatically quantitated by the program software based on the values of the standards and stored in the data base.

9.6 See the TJA operator's manual for a detailed explanation of computer program software quantitation.

9.7 Calibration

9.7.1 Set up the instrument with the operating parameters established in 9.1 and allow the instrument to become thermally stable.

9.7.2 Perform a vertical and horizontal profile and save the results in a file and record the results in the Logbook.

9.7.2.1 Use a 5 mg/L manganese standard to test the peak intensity and position of the spectra.

9.7.2.2 The acceptable range of peak position must be less than the absolute value of 0.0200.

9.7.2.3 The acceptable range of peak intensity must be in between 500 and 700.

9.7.3 Calibration: Three-point standardization using three standards.

9.7.3.1 Standard Blank/Calibration blank that is 1% HNO_3/5% HCL. All three calibration standards are prepared from three bottles of costumer standards in the same matrix.

9.7.3.2 Standard 1M - See Table 2A

9.7.3.3 Standard 2M - See Table 2B

9.7.3.4 Standard 3M - See Table 2C

9.7.4 The instrument calibration is checked by analyzing the highest mixed calibration standards. The concentration values obtained must be within ±5% of the actual values. After the high standards are analyzed, an initial calibration verification solution (ICV) and an initial calibration blank (ICB) are analyzed. The concentration values obtained for the ICV should not deviate from the actual values by more than ±10% and the ICB should be < the Report Limit. See Table 3 for true values of ICV.

9.7.5 When calibration criteria are not achieved, corrective actions are taken and samples are not analyzed until calibration criteria are achieved.

9.7.6 Dilute and reanalyze samples that are more concentrated than the linear calibration limit.

10.0 DOCUMENTATION

10.1 A copy of the raw data will be placed in the job folder along with any calculations needed to report the data in the LIMS format.

10.2 A copy of the LIMS report will be included in the job folder.

11.0 REFERENCES

11.1 USEPA, Test Methods for Evaluating Solid Waste (SW-846), Update III, May, 1997.

TABLE 1
REAGENTS AND SOLVENTS

1	2	3	4	5	6	7
Reagent Solvent (Name)	**Reagent/ Solvent (%Purity)**	**Desired Reagent/ Solvent Strength or Conc. (a)**	**Reagent/ Solvent Vol./Wt. Used (b)**	**Adjusted Net Weight (c)**	**Final Volume**	**Comments**
Nitric Acid	Trace Metal Grade	Conc.	NA	NA	NA	
Hydrochloric Acid	Trace Metal Grade	Conc.	NA	NA	NA	

(a) Can be expressed as %, N, M, etc.

(b) Volume or weight used to prepare desired strength or concentration, column 3.

(c) Corrected for purity. This is an optional step dependent on group leader, QA requirements and/or the purpose and use of the reagent or solvent.

TABLE 2A - STANDARD 1M

Element (Name)	Standard Conc. (mg/L)	Standard Volume Used	Final Volume	Standard Conc. (mg/L)
Aluminum	5000	0.1 mL	"	5
Antimony	1000	0.1 mL	"	1
Arsenic	1000	0.1 mL	"	1
Barium	100	0.1 mL	"	0.1
Beryllium	100	0.1 mL	"	0.1
Boron	500	0.1 mL	"	0.5
Cadmium	200	0.1 mL	"	0.2
Calcium	5000	0.1 mL	"	5
Chromium	100	0.1 mL	"	0.1
Cobalt	100	0.1 mL	"	0.1
Copper	100	0.1 mL	"	0.1
Iron	2000	0.1 mL	"	2
Lead	200	0.1 mL	"	0.2
Magnesium	5000	0.1 mL	"	5
Manganese	100	0.1 mL	"	0.1
Molybdenum	300	0.1 mL	"	0.3
Nickel	200	0.1 mL	"	0.2
Potassium	10000	0.1 mL	"	10
Selenium	1000	0.1 mL	"	1
Silver	200	0.1 mL	"	0.2
Sodium	10000	0.1 mL	"	10
Strontium	100	0.1 mL	"	0.1
Thallium	1000	0.1 mL	"	1
Titanium	1000	0.1 mL	"	1
Tin	1000	0.1 mL	"	1
Vanadium	100	0.1 mL	"	0.1
Zinc	200	0.1 mL	"	0.2

Working standards expire one month from the date of preparation except when one or more of the source standards expire on an earlier date. In such a case, the earliest expiration date becomes the expiration date of the working standard.

TABLE 2B - STANDARD 2M

Element (Name)	Standard Conc. (mg/L)	Standard Volume Used	Final Volume	Standard Conc. (mg/L)
Aluminum	5000	0.5 mL	"	25
Antimony	1000	0.5 mL	"	5
Arsenic	1000	0.5 mL	"	5
Barium	100	0.5 mL	"	0.5
Beryllium	100	0.5 mL	"	0.5
Boron	500	0.5 mL	"	2.5
Cadmium	200	0.5 mL	"	1
Calcium	5000	0.5 mL	"	2.5
Chromium	100	0.5 mL	"	0.5
Cobalt	100	0.5 mL	"	0.5
Copper	100	0.5 mL	"	0.5
Iron	2000	0.5 mL	"	10
Lead	200	0.5 mL	"	1
Magnesium	5000	0.5 mL	"	25
Manganese	100	0.5 mL	"	0.5
Molybdenum	300	0.5 mL	"	1.5
Nickel	200	0.5 mL	"	1
Potassium	10000	0.5 mL	"	50
Selenium	1000	0.5 mL	"	5
Silver	200	0.5 mL	"	1
Sodium	10000	0.5 mL	"	50
Strontium	100	0.5 mL	"	0.5
Thallium	1000	0.5 mL	"	5
Titanium	1000	0.5 mL	"	5
Tin	1000	0.5 mL	"	5
Vanadium	100	0.5 mL	"	0.5
Zinc	200	0.5 mL	"	1

Working standards expire one month from the date of preparation except when one or more of the source standards expire on an earlier date. In such a case, the earliest expiration date becomes the expiration date of the working standard.

TABLE 2C - STANDARD 3M

Element (Name)	Standard Conc. (mg/L)	Standard Volume Used	Final Volume	Standard Conc. (mg/L)
Aluminum	5000	1.0 mL	"	50
Antimony	1000	1.0 mL	"	10
Arsenic	1000	1.0 mL	"	10
Barium	100	1.0 mL	"	1
Beryllium	100	1.0 mL	"	1
Boron	500	1.0 mL	"	5
Cadmium	200	1.0 mL	"	2
Calcium	5000	1.0 mL	"	50
Chromium	100	1.0 mL	"	1
Cobalt	100	1.0 mL	"	1
Copper	100	1.0 mL	"	1
Iron	2000	1.0 mL	"	20
Lead	200	1.0 mL	"	2
Magnesium	5000	1.0 mL	"	50
Manganese	100	1.0 mL	"	1
Molybdenum	300	1.0 mL	"	3
Nickel	200	1.0 mL	"	2
Potassium	10000	1.0 mL	"	100
Selenium	1000	1.0 mL	"	10
Silver	200	1.0 mL	"	2
Sodium	10000	1.0 mL	"	100
Strontium	100	1.0 mL	"	1
Thallium	1000	1.0 mL	"	10
Titanium	1000	1.0 mL	"	10
Tin	1000	1.0 mL	"	10
Vanadium	100	1.0 mL	"	1
Zinc	200	1.0 mL	"	2

Working standards expire one month from the date of preparation except when one or more of the source standards expire on an earlier date. In such a case, the earliest expiration date becomes the expiration date of the working standard.

TABLE 3
ICV/CCV

Element (Name)	Standard Conc. (ppm)	Standard Vol./Wt. Used	Solvent/ Diluent (name)	Final Volume	Desired Working Standard Conc. (ppm)
Aluminum	2500	1 mL (a)	1% HNO_3 5% HCL	100 mL	25
Antimony	1000	1 mL (b)	"	"	10
Arsenic	500	1 mL (a)	"	"	5
Barium	50	1 mL (a)	"	"	0.5
Beryllium	50	1 mL(a)	"	"	0.5
Boron	500	1 mL (a)	"	"	5
Cadmium	100	1 mL (a)	"	"	1
Calcium	2500	1 mL (a)	"	"	25
Chromium	50	1 mL(a)	"	"	0.5
Cobalt	50	1 mL (a)	"	"	0.5
Copper	50	1 mL (a)	"	"	0.5
Iron	1000	1 mL (a)	"	"	10
Lead	100	1 mL(a)	"	"	1
Magnesium	2500	1 mL (a)	"	"	25
Manganese	50	1 mL (a)	"	"	0.5
Molybdenum	100	1 mL (b)	"	"	1
Nickel	100	1 mL (a)	"	"	1
Potassium	2500	1 mL (a)	"	"	25
Selenium	1000	1 mL (a)	"	"	10
Silver	100	1 mL (a)	"	"	1
Sodium	2500	1 mL (a)	"	"	25
Strontium	100	1 mL (a)	"	"	1
Thallium	1000	1 mL (a)	"	"	10
Tin	500	1 ml (b)	"	"	5
Titanium	1000	1 mL (b)	"	"	10
Vanadium	50	1 mL (a)	"	"	0.5
Zinc	100	1 mL (a)	"	"	1

(a) Al,Ca,Mg,K,Na,Fe,Se,Tl,As,B,Cd,Pb,Ni,Ag,Sr,Zn,Ba,Be,Cr,Co,Cu,Mn,V are in a mixed standard.
(b) Sb,Ti,Sn,Mo are in a mixed standard.

Working standards expire one month from the date of preparation except when one or more of the source standards expire on an earlier date. In such a case, the earliest expiration date becomes the expiration date of the working standard.

TABLE 4
ICSAB

Element (Name)	Standard Conc. (ppm)	Standard Volume Used	Solvent/ Diluent (name)	Final Volume	Desired Working Standard Conc. (ppm)
Aluminum	5000	10 mL	1% HNO_3 5% HCL	100 mL	500
Barium	50	1 mL	"	"	0.5
Beryllium	50	1 mL	"	"	0.5
Cadmium	100	1 mL	"	"	1
Calcium	5000	10 mL	"	"	500
Chromium	50	1 mL	"	"	0.5
Cobalt	50	1 mL	"	"	0.5
Copper	50	1 mL	"	"	0.5
Iron	2000	10 mL	"	"	200
Lead	100	1 mL	"	"	1
Magnesium	5000	10 mL	"	"	500
Manganese	50	1 mL	"	"	0.5
Nickel	100	1 mL	"	"	1
Silver	100	1 mL	"	"	1
Vanadium	50	1 mL	"	"	0.5
Zinc	100	1 mL	"	"	1

Working standards expire one month from the date of preparation except when one or more of the source standards expire on an earlier date. In such a case, the earliest expiration date becomes the expiration date of the working standard.

TABLE 5
SPIKING STANDARDS

Element (Name)	Spike Conc. (ppm)	Spike Volume Used for Waters	Vol. of Water Sample Used (mL)	Final Spike Conc. Water (ppb)	Spike Volume Used for Soils	Wt. Of Soil Sample Used (grams)	Final Spike Conc. Soil (ppm)
Aluminum	200	0.5 mL	50.0	2000	1 mL	2.0	100
Antimony	50	"	"	500	"	"	25
Arsenic	200	"	"	2000	"	"	100
Barium	200	"	"	2000	"	"	100
Beryllium	5	"	"	50	"	"	2.5
Cadmium	5	"	"	50	"	"	2.5
Calcium	1000	"	"	10000	"	"	500
Chromium	20	"	"	200	"	"	10
Cobalt	50	"	"	500	"	"	25
Copper	25	"	"	250	"	"	12.5
Iron	100	"	"	1000	"	"	50
Lead	50	"	"	500	"	"	25
Magnesium	1000	"	"	10000	"	"	500
Manganese	50	"	"	500	"	"	25
Molybdenum	50	"	"	500	"	"	25
Nickel	50	"	"	500	"	"	25
Potassium	1000	"	"	10000	"	"	500
Selenium	200	"	"	2000	"	"	100
Silver	5	"	"	50	"	"	2.5
Sodium	1000	"	"	10000	"	"	500
Thallium	200	"	"	2000	"	"	100
Titanium	200	"	"	2000	"	"	100
Vanadium	50	"	"	500	"	"	25
Zinc	50	"	"	500	"	"	25

Spiking standard solutions expire one year from the date of preparation except when one or more of the source standards expire on an earlier date. In such a case, the earliest expiration date becomes the expiration date of the spiking standard.

ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS (PCBs)

SW-846 Method 8081 or 8080

Table 1A. Summary of Holding Times and Preservation for Organochlorine Pesticides and Polychlorinated Biphenyls (PCBs)

Analytical Parameter [a]	Technical and Contract Holding Times	Preservation
Organochlorine Pesticides and Polychlorinated Biphenyls (PCBs) in Water Samples	Technical for Extraction: 7 days from collection; Contract for Extraction: 5 days from receipt at laboratory Technical and Contract for Analysis: 40 days from extraction	Cool to 4•C ±2•C
Organochlorine Pesticides and Polychlorinated Biphenyls (PCBs) in Soil Samples	Technical for Extraction: 14 days from collection; Contract for Extraction: 10 days from receipt at laboratory Technical and Contract for Analysis: 40 days from extraction	Cool to 4•C ±2•C

[a] Individual target compounds are listed in Table 1B.

Data Calculations and Reporting Units:

Calculate the calibration factors (CF) of single component pesticides according to Section 7.4.2 of SW-846 Method 8000A. Calculate sample results using the analyte CFs from the midpoint standard of the associated initial calibration curve. Perform sample quantitation for multiple components pesticides according to Section 7.6 of SW-846 Method 8080A or 8081.

Report water sample results in concentration units of micrograms per liter (•g/L). Report soil sample results on a dry-weight basis in micrograms per kilogram (•g/kg).

For rounding results, adhere to the following rules:
a) If the number following those to be retained is less than 5, round down;
b) If the number following those to be retained is greater than 5, round up; or
c) If the number following the last digit to be retained is equal to 5, round down if the digit is even, or round up if the digit is odd.

All records of analysis and calculations must be legible and sufficient to recalculate all sample concentrations and QC results. Include an example calculation in the data package.

TABLE 1B. Target Compound List, CAS Numbers, and Contract Required Quantitation Limits (CRQL) for SW-846 Method 8081 or Method 8080

COMPOUND	CAS No.	CRQL Water µg/L	CRQL Soil µg/kg
alpha-BHC	319-84-6	0.05	2
beta-BHC	319-85-7	0.05	2
delta-BHC	319-86-8	0.05	2
gamma-BHC (Lindane)	58-89-9	0.05	2
Heptachlor	76-44-8	0.05	2
Aldrin	309-00-2	0.05	2
Heptachlor epoxide	1024-57-3	0.05	2
Endosulfan I	959-98-8	0.05	2
Dieldrin	60-57-1	0.1	3
4,4'-DDE	72-55-9	0.1	3
Endrin	72-20-8	0.1	3
Endosulfan II	33213-65-9	0.1	3
4,4'-DDD	72-54-8	0.1	3
Endosulfan sulfate	1031-07-8	0.1	3
4,4'-DDT	50-29-3	0.1	3
Methoxychlor	72-43-5	0.5	17
Endrin ketone	53494-70-5	0.1	3
Endrin aldehyde	7421-93-4	0.1	3
alpha-Chlordane	5103-71-9	0.05	2
gamma-Chlordane	5103-74-2	0.05	2
Toxaphene	8001-35-2	5	170
Aroclor-1016	12674-11-2	1	33
Aroclor-1221	11104-28-2	2	67
Aroclor-1232	11141-16-5	1	33
Aroclor-1242	53469-21-9	1	33
Aroclor-1248	12672-29-6	1	33
Aroclor-1254	11097-69-1	1	33
Aroclor-1260	11096-82-5	1	3

Table 2. Summary of Calibration Procedures for Organochlorine Pesticides and Polychlorinated Biphenyls (PCBs) by SW-846 Method 8081 or 8080

Calibration Element	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration (minimum blank + 3 points for each analyte) (ICAL) [a, b,c]	Initially; whenever required, due to failure of CCV	RSD for CFs •20% (•30% for Surrogate compounds)	1. Terminate analysis 2. Re-calibrate and verify before sample analysis
Continuing Calibration Verification (CCV) at midpoint of ICAL	Beginning of each day, after every 10 samples, and end of run	%D between CF of CCV and avg CFs from ICAL •25%	1. Re-calibrate and verify 2. Re-analyze samples back to last good CCV
Endrin and 4,4'-DDT Breakdown	Beginning and end of analytical sequence	•20% each or •30% combined	1. Investigate source of the problem and document 2. If either Endrin, 4,4'-DDT, or their breakdown products were detected, re-analyze the samples

[a] The ICAL low standard must be above but near the CRQL. The low ICAL standard must have a signal to noise ratio •5:1. If this requirement cannot be met, the laboratory must submit a MDL study as part of the data package.

[b] ICAL Prepare initial calibration individual standard mixtures A and B (IND A and IND B) containing the single component pesticides specified in Table 9 of SW-846 Method 8081 at three concentration levels. For multiple response pesticides, including toxaphene and Aroclors (except 1016 and 1260), prepare separate initial calibration standards at the following concentration levels: Aroclors (except 1221)at 100 ng/mL; Aroclor-1221 at 200 ng/mL; and toxaphene at 500 ng/mL. Aroclor-1016 and Aroclor-1260 may be combined into a single standard solution. Spike all calibration standards with the surrogate compounds discussed in Table 3 at a concentration of 20 ng/mL.

[c] Report the retention time window for each analyte. For multiple component pesticides, calculate the retention time window for 5 major peaks from the initial calibration standard analysis.

Determine retention time windows for both single and multiple component pesticides using the following guidelines:

Column Type	Retention Time Window in Minutes
Packed Column	• ± 2%
Mega bore or wide bore capillary column	• ±0.05 for tetrachloro-m-xyle e through Aldrin • ±0.07 for compounds which elute after Aldrin • ±0.1 for decachlorobiphenyl

Table 3. Summary of Internal Quality Control Procedures for Organochlorine Pesticides and Polychlorinated Biphenyls (PCBs) by SW-846 Method 8081 or 8080

QC Element	Frequency	Acceptance Criteria	Corrective Action
Method Blank (MB)	One per Batch or SDG[a] (1 per 20 samples minimum)	< CRQL for each compound	1. Investigate source of contamination and document 2. Re-extract and re-analyze all samples processed with a non-compliant method blank
Surrogate [b]	Every standard, sample, method blank and QC sample at 10 times CRQL	60-150% of expected value	1. Re-analyze all samples with non-compliant surrogate recoveries
Matrix Spike and Matrix Spike Duplicate (MS/MSD)[c]	One MS/MSD set per batch or SDG (1 MS/MSD set per 20 samples minimum)	50-135% of expected value; •30 RPD between MS and MSD	1. Address in narrative

[a] SDG - Sample Delivery Group - each case of field samples received; or each 20 field samples within a case; or each 14 calendar day period during which field samples in a case are received.

[b] Spike each standard, sample, and blank with 1mL of a solution containing 0.2 •g/mL each of tetrachloro-m-xylene and decachlorobiphenyl

[c] Spike MS/MSD samples with 1mL of a solution containing the following compounds and levels:

Target compound	Concentration (•g/mL)	Target Compound	Concentration (•g/mL)
?-BHC	0.5	Heptachlor	0.5
4,4'-DDT	1.0	Aldrin	0.5
Endrin	1.0	Dieldrin	1.0

Dilute and re-analyze samples with one or more analytes at concentrations exceeding the range of the calibration curve. Results for such re-analyses should fall within the mid-range of the calibration curve. Report results and submit documentation for both analyses.

Second column confirmation is required for all positive results. Perform confirmation analyses on a column of a phase different from that used for quantitation. Confirmation analyses must meet all instrument calibration criteria and blank acceptance criteria specified in Table 2, above.

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Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
8081A Pesticides in Soil (EPA 8081A)								
Preservation: Store cool at 4°C								
Container: 4 oz. jar		**Amount Required:** 30 g			**Hold Time:** 14 days			
Aldrin	0.13	1.7 µg/kg			47 - 138	35	47 - 132	30
alpha-BHC	0.00061	1.7 µg/kg						
beta-BHC	0.12	1.7 µg/kg						
delta-BHC	0.70	1.7 µg/kg						
gamma-BHC (Lindane)	0.12	1.7 µg/kg			38 - 144	35	56 - 133	30
Chlordane	1.0	20 µg/kg						
4,4´-DDD	0.24	3.3 µg/kg						
4,4´-DDE	0.22	3.3 µg/kg						
4,4´-DDT	0.12	3.3 µg/kg			41 - 157	35	46 - 137	30
Dieldrin	0.19	3.0 µg/kg			46 - 155	35	44 - 143	30
Endosulfan I	0.13	1.7 µg/kg						
Endosulfan II	0.14	3.3 µg/kg						
Endosulfan sulfate	0.13	3.3 µg/kg						
Endrin	0.092	3.3 µg/kg			34 - 149	35	30 - 147	30
Endrin aldehyde	0.13	3.3 µg/kg						
Heptachlor	0.10	1.7 µg/kg			36 - 155	35	33 - 148	30
Heptachlor epoxide	0.13	1.7 µg/kg						
Kepone	0.15	2.5 µg/kg						
Methoxychlor	0.15	17 µg/kg						
Mirex	0.54	3.3 µg/kg						
Toxaphene	2.6	20 µg/kg						
Prowl (Pendimethalin)		2.0 µg/kg						
surr: Tetrachloro-meta-xylene			46 - 139					
surr: Decachlorobiphenyl			52 - 141					

CLS Labs

STANDARD OPERATING PROCEDURES
APPROVAL FORM

EPA Method:	8081A	Revision No.:	8081AS-3
Title of SOP:	Organochlorine Pesticides in Soil	Revision Date:	August 4, 2004
Author:	John Eisner	Replaces No.:	8081A-2
Author's Title:	GC Chemist	Dated:	Oct. 20, 2000

The following people have reviewed this Standard Operating Procedure (SOP) and have recommended its approval.

Signature and Title

(SOP Author)	(Date)
(Department Manager Review)	(Date)
(QA/QC Manager Approval)	(Date)
(Laboratory Director Approval)	(Date)

Periodic Review:

Signature	Title	Date

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1.0 SCOPE AND APPLICATION

1.1 This procedure is according to EPA method 8081A for analysis of various organochlorine pesticides in various solid matrices such as soil and waste samples. The target compounds analyzed using this method are:

ANALYTE:	CAS #
Aldrin	309-00-2
α-BHC	319-84-6
β-BHC	319-85-7
γ-BHC (Lindane)	58-89-9
δ-BHC	319-86-8
Chlordane	12789-03-6
4,4'-DDD	72-54-8
4,4'-DDE	72-55-9
4,4'-DDT	50-29-3
Dieldrin	60-57-1
Endosulfan I	959-98-8
Endosulfan II	33212-65-9
Endosulfan sulfate	1031-07-8
Endrin	72-20-8
Endrin aldehyde	7421-93-4
Heptachlor	76-44-8
Heptachlor epoxide	1024-57-3
4,4'-Methoxychlor	72-43-5
Toxaphene	8001-35-2

2.0 METHOD SUMMARY

2.1 This method provides gas chromatographic conditions for the detection of ppb concentrations of certain organochlorine pesticides from solid sample extracts. Prior to the use of this method, appropriate sample extraction techniques must be used (e.g., SOP3550A or the LUFT shaker method). Both neat and diluted organic liquids (Method 3580, Waste Dilution) may be analyzed by direct injection. A 2 µL sample is injected into a gas chromatograph (GC), and compounds in the GC effluent are detected by an electron capture detector (ECD).

3.0 DEFINITIONS

3.1 Method Blank (BLK): An aliquot of Ottawa Sand, spiked with surrogates, that is treated exactly as a sample throughout the entire extraction and analytical procedure. The BLK is used to determine if method analytes or other interferences are present in the laboratory environment, reagents, or the apparatus.

3.2 Field Reagent Blank (FRB) *aka* Trip Blank: Reagent water placed in a sample container in the laboratory and treated as a sample in all respects, including exposure to sampling site conditions, storage, preservation and all analytical procedures. The purpose of the FRB is to determine if method analytes or other interferences are present in the field environment.

3.3 Blank Spike and Blank Spike Duplicate (BS and BSD): Two aliquots of reagent water extracted separately, to which known quantities of the method analytes and surrogates are added. The BS and BSD are treated exactly the same as a sample throughout the extraction and analytical procedure. The purpose of the BS and BSD is to monitor the accuracy and precision of the entire procedure.

3.4 Matrix Spike and Matrix Spike Duplicate (MS and MSD): Two aliquots of an environmental sample extracted separately, to which known quantities of the method analytes and surrogates are added. The MS and MSD are treated the same as a sample throughout the extraction and analytical procedure. The purpose of the MS and MSD is to determine whether the sample matrix contributes bias to the analytical results, and to monitor the accuracy and precision of the method. The background concentrations of the sample matrix must be determined in a separate aliquot, and the measured values (if any) in the MS and MSD corrected by this amount.

3.5 Laboratory Duplicates (LD1 and LD2): Two sample aliquots taken in the analytical laboratory and analyzed separately with identical procedures. Analyses of LD1 and LD2 give a measure of the precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

3.6 Field Duplicates (FD1 and FD2): Two separate samples collected at the same time and place under identical circumstances and treated exactly the same throughout field and laboratory procedures. Analyses of FD1 and FD2 give a measure of the precision associated with sample collection, preservation and storage, as well as with laboratory procedures.

3.7 Laboratory Performance Check Solution (LPC) *aka* Instrument Performance Check Solution (IPC): A solution of selected method analytes used to evaluate the performance of the instrumental system with respect to a defined set of method criteria.

3.8 Breakdown Standard: Known amount of method analytes, analyzed as a sample, used to monitor the breakdown of one compound to another form (Aldehyde, Ketone, etc.). Breakdown % is an indication of instrument (GC) performance.

3.9 Calibration Standards: Known amounts of method analytes, in solution, prepared from stock standards and used to calibrate the instrument response with respect to analyte concentration.

3.10 Continuing Calibration Check Standard: A standard solution containing a selected number of the analytes of interest, which is analyzed periodically to verify the accuracy of the existing calibration curves or response factors of those analytes.

3.11 Surrogate Standards: Known amounts of compounds that are not a part of the method analytes, added at the beginning of the extraction procedure. Quantitated the same way as method analytes, surrogates monitor the method performance.

3.12 Spike Standards: Known amounts of method analytes, in solution, that are added to the BS/BSD and MS/MSD at the beginning of the extraction procedure. The recovery of these compounds monitors the accuracy and precision of the extraction and analytical procedure.

3.13 Method Detection Limit (MDL): The minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

3.14 Practical Quantitation Limit (PQL) *aka* Reporting Limit (RL): The maximum or minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be quantified with the confidence level accuracy required by the data user.

4.0 HEALTH AND SAFETY

4.1 Proper safety procedures should be used when handling all chemicals and samples; this includes at a minimum wearing gloves, lab coat, and eye protection. See CLS Labs Chemical Hygiene plan for more detailed information on safety.

4.2 The toxicity or carcinogenicity of the chemicals used in this method has not been precisely defined. Each chemical should be treated as a potential health hazard, and exposure to these chemicals should be minimized. CLS Labs is responsible for maintaining awareness of OSHA regulations regarding safe handling of chemicals used in this method. Additional references to laboratory safety are found in the CLS Labs Chemical Hygiene Plan.

5.0 SAMPLE HANDLING AND PRESERVATION

5.1 Soil samples are collected in brass tubes or glass jars and stored at 4°C.

5.2 Samples must be extracted within 14 days from date of collection and extract must be analyzed within 40 days from date of extraction.

6.0 INTERFERENCES

6.1 Interferences by phthalate esters can pose a major problem in pesticide determinations when using the electron capture detector. These compounds generally appear in the chromatogram as large late-eluting peaks, especially in the 15% and 50% fractions from the Florisil cleanup. These phthalates are easily extracted or leached from such materials during laboratory operations. Cross contamination of clean glassware routinely occurs when plastics are handled during extraction steps, especially when solvent-wetted surfaces are handled. Interferences from phthalates can best be minimized by avoiding contact with any plastic materials. Exhaustive cleanup of reagents and glassware may be required to eliminate background phthalate contamination.

6.2 Elemental sulfur and thiols may be found in solid waste samples and will interfere with the resolution of peaks at the late end of the chromatogram. These samples may need to undergo preliminary cleanup prior to extraction.

7.0 APPARATUS AND MATERIALS

7.1 Gas chromatograph

7.1.1 HP 6890 dual column, dual ECD.

7.2 Columns

7.2.1 Quant Column: Restek CLPesticides, 30m x 0.53mm

7.2.2 Conf. Column: Restek CLPesticides II, 30m x 0.53mm

7.3 Glassware

7.3.1 2.0 mL autosampler vials and caps, crimp tool.

7.3.2 1.0 mL disposable pipets and pipet suction bulb.

7.3.3 250 mL amber bottles with VOA caps.

7.3.4 Volumetric flasks, Class A: 250 mL and 500 mL, with ground-glass stoppers

7.3.5 Microsyringe: 10, 25, 50, 100 µL.

Chemical Reagents and Standards

7.4 Reagents

7.4.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination. For detailed information on the reagents and standards used by CLS see the CLS Reagent/Standard SOP.

7.4.2 Ottawa Sand: Reagent grade sand from Accusand Specialty Standards, 20/30 grit, Ottawa Plant, Le Sueur, MN.

7.4.3 Solvents

7.4.3.1 Hexane, C_6H_{14} - Pesticide quality.

7.4.3.2 Acetone, CH_3COCH_3 - Pesticide quality.

7.4.3.3 Methylene chloride CH_2Cl_2 - Pesticide quality

7.5 Standards

7.5.1 Stock Standard Solutions

7.5.1.1 If possible, stock standards will be bought premixed and will be diluted down for working standards (all standards bought will follow the guidelines described in the CLS Reagent/Standard SOP).

7.5.1.2 Stock standards are stored at 4.0°C and are disposed of when they reach their expiration date.

7.5.2 Pesticide Calibration Mix: A mixture of the first 18 compounds listed on page 3, plus the surrogates TCMX and DCB, all at 100 ppb in hexane. Prepare in a 250 mL volumetric flask and store in a 250 mL amber bottle with a VOA cap at 4.0°C. Expires 1 year from preparation date. This standard is diluted into 5 levels for calibration, using a 1.0 mL disposable pipet and 2.0 mL autosampler vials. LVL#1 (100 ppb), LVL#2 (75 ppb), LVL#3 (50 ppb), LVL#4 (25 ppb), LVL#5 (10 ppb).

7.5.3 Mirex/Kepone Mix: A mixture of the two compounds Mirex and Kepone at 100 ppb in hexane. Prepare in a 250 mL volumetric

flask and store in a 250 mL amber bottle with a VOA cap at 4.0°C. Expires 1 year from preparation date. This standard is diluted into 5 levels for calibration, using a 1.0 mL disposable pipet and 2.0 mL autosampler vials. LVL#1 (100 ppb), LVL#2 (75 ppb), LVL#3 (50 ppb), LVL#4 (25 ppb), LVL#5 (10 ppb).

7.5.4 Chlordane Mix: A mixture of technical grade Chlordane at 1,000 ppb in hexane. Prepare in a 250 mL volumetric flask and store in a 250 mL amber bottle with a VOA cap at 4.0°C. Expires 1 year from preparation date. This standard is diluted into 5 levels for calibration, using a 1.0 mL disposable pipet and 2.0 mL autosampler vials. LVL#1 (1000 ppb), LVL#2 (750 ppb), LVL#3 (500 ppb), LVL#4 (250 ppb), LVL#5 (100 ppb).

7.5.5 Toxaphene Mix: A mixture of Toxaphene at 1,000 ppb in hexane. Prepare in a 250 mL volumetric flask and store in a 250 mL amber bottle with a VOA cap at 4.0°C. Expires 1 year from preparation date. This standard is diluted into 5 levels for calibration, using a 1.0 mL disposable pipet and 2.0 mL autosampler vials. LVL#1 (1000 ppb), LVL#2 (750 ppb), LVL#3 (500 ppb), LVL#4 (250 ppb), LVL#5 (100 ppb).

7.5.6 Endrin/4,4'-DDT Breakdown Standard: A mixture of the two compounds Endrin and 4,4'-DDT at 50 ppb in hexane. Prepare in a 250 mL volumetric flask and store in a 250 mL amber bottle with a VOA cap at 4.0°C. Expires 1 year from preparation date. No dilutions are made of this standard.

7.5.7 Surrogate Spike Standard: A mixture of TCMX and DCB at 250 ppb in acetone. Prepare in a 500 mL volumetric flask, store in 2 250ml amber bottles with VOA caps at 4.0°C. Expires 1 year after preparation date. One (1.0) mL of this standard is added to every sample, BLK, BS/BSD, MS/MSD.

7.5.8 Matrix Spike Standard: A mixture of 6 compounds. γ-BHC (Lindane), Heptachlor, Aldrin at 125 ppb, Dieldrin, Endrin, 4,4'-DDT at 250 ppb in acetone. Prepare in a 500 mL volumetric flask and store in 2 250 mL amber bottles with VOA caps at 4.0°C. Expires 1 year after preparation date. One (1.0) mL of this standard is added to every BS/BSD & MS/MSD.

8.0 QUALITY CONTROL

8.1 Sections 8.1.1 through 8.1.9 are the General QC requirements for 8081A analysis; for detailed information on these requirements see CLS's Organic QC SOP.

8.1.1 A QC check sample containing all analytes of interest to be run once in the life of the method.

8.1.2 Perform a Method Detection Limit (MDL) determination at least annually or as needed. The data for this determination are available for easy reference in the 8081 file cabinet located in GC/NV office, or the QA/QC supervisor.

8.1.3 Retention time windows will be established for all analytes of interest. This will be done on a one time basis per column. This means that a retention time window will be good for the life of the column.

8.1.4 A 5 point calibration (ICV) for all method analytes (7.5.2, 7.5.3, 7.5.4, 7.5.5) is plotted by instrument response vs. standard concentration in a linear relationship, through the origin, with a % relative standard deviation ≤ 20.

8.1.5 A complete analysis will include an Initial Calibration Verification (ICV), Continuing Calibration Verification (CCV), and a Final Calibration Verification (FCV). The ICV will be run immediately prior to any analysis. The CCV will be run after each group of 10 samples in the analysis sequence. The FCV will be run at the end of all sample analysis. All CCV's must have relative percent difference $\leq 15\%$ from ICV.

8.1.6 A method blank (BLK) shall be analyzed with each batch (the number of total samples in a QC batch should not exceed 20 samples plus the number of samples required to perform QC evaluation of the 20 initial samples.

8.1.7 At least one matrix spike (MS) and one matrix spike duplicate (MSD) will be analyzed per analytical batch, sample volume permitting.

8.1.8 A laboratory control sample (BS) and laboratory control sample duplicate (BSD) will be processed with each analytical batch.

8.1.9 Analyst should monitor the performance of the extraction, cleanup (when used), and analytical system and the effectiveness of the method in dealing with each sample matrix by spiking each sample, standard, and organic-free reagent water blank with surrogates.

9.0 ANALYTICAL PROCEDURES

9.1 Extraction

9.1.1 Refer to appropriate extraction SOP.

9.1.2 Soil and solid waste samples are normally slurried with a specified volume of methylene chloride and shaken for a specified time. The sample is then concentrated and solvent exchanged with hexane for GC analysis.

9.2 Chromatographic conditions:

9.2.1 Carrier gas: Helium @ 14mL/min.
9.2.2 Make-up gas: Nitrogen @ 60mL/min.
9.2.3 ECD temperature: 300°C
9.2.4 Injector temperature: 250°C
9.2.5 GC oven temperature: 120°C hold 1 minute; ramp up 9°C/minute to 300°C; hold 2 minutes.

9.3 Loading standards and samples:

9.3.1 Before samples are loaded onto the GC, the instrument must be calibrated. Calibration standards (7.5.2 – 7.5.5) are run on the instrument in the same manner as samples. Standards or sample extracts should be run at room temperature. The #1 position on the autosampler tray is always an Endrin/4,4'-DDT breakdown standard (7.5.6). This standard must be run every 12 hours (20 vials). Standard vials are then placed on the autosampler tray, with the standards placed highest concentration to lowest in the #2-21 positions, 1 CCV (LVL#3) of each standard mix in positions #22-25. Sample extracts may now be on the autosampler tray, starting at position #26 with the BLK, BS, BSD, MS, MSD, then samples. After every ten vials, CCV's from each standard mix (7.5.2 – 7.5.5) must be analyzed (i.e. you must have beginning CCV's, CCV's after every ten vials, and end very run with CCV's). Samples go in order between the CCV's.

9.4 Building a sequence:

9.4.1 After the autosampler vials have been loaded onto the autosampler tray in their proper positions, a sequence must be entered into the data system that corresponds with the id's of the standard and sample vials. With mouse, select from Toolbar at the bottom of screen GC022 GCTOP/Environm...., then click once. On the window that appears, select Sequence with mouse, click once, then click once on Edit Sample Log Table..... Enter the id's of the vials on the autosampler tray starting with vial #1. After all the id's have been entered, click OK once with mouse. Again, click Sequence once with mouse, then click save. On the

window that appears, enter the current month/day in the box titled File name, then click Select once with mouse.

9.5 Starting the GC:

9.5.1 With mouse, select from Toolbar at the bottom of the screen GC022 GCTOP/Environm..., click once. On the window that appears, select Sequence with mouse, click once, and click once on Position and run.....Click once on Line #1, then click once on OK. On the screen that appears, enter the current month/day in the Data file directory box, then click Run Sequence. Instrument will now start.

9.6 Loading files:

9.6.1 With mouse, select from Toolbar at bottom of screen Environmental Data Anal... , click once. Click once on File with mouse, then click Load Data File. On the window that appears, be sure the Path has the particular month/day for your sequence. With mouse, click on the vial #1 position and then click OK once. File is now loaded.

9.7 Updating calibration table:

9.7.1 Load the first standard data file (9.6.1) from a 5 point calibration. With mouse, select InitCal and click once, then click once on Update Levels. On the screen that appears, change selections to Recalibrate, 100, Replace, Replace. Once these edits are made, click Do Update with mouse. The first level is now updated, and all other levels must be updated in a likewise manner.

9.8 Quantitating sample and CCV chromatograms:

9.8.1 Load the first sample data file (9.6.1). With mouse, click once on Quant, then click Calculate/Generate Report. Sample chromatogram and data print out.

9.8.2 Sample chromatograms are qualitatively compared to the calibration standards by retention times (RT). Sample RT must be within 0.050 minutes of standard chromatogram on both columns, and the relative % difference of the concentration (ppb) between the two columns may not exceed 40% to consider a compound positive. Positive sample concentrations may not exceed more than 20% of the linear range for any compound at the instrument. If instrument concentration exceeds this level, dilutions are required to bring the extract into range. No compound may be reported below the lowest standard unless appropriately qualified or flagged.

9.9 Calculations and Acceptance Values

9.9.1 *CCV's:

True Value (7.5.2, 7.5.3) = 50 ppb. Allowable % difference is 15%.

$$\text{Calculation} = \frac{(\text{instrument value} - 50\ \text{ppb})100\%}{50\ \text{ppb}}$$

True Value (7.5.4, 7.5.5) = 500 ppb. Allowable % difference is 15%.

$$\text{Calculation} = \frac{(\text{instrument value} - 500\ \text{ppb})100\%}{500\ \text{ppb}}$$

9.9.2 Endrin/DDT Breakdown standard (7.5.6):

True Value Endrin and 4,4'-DDT = 50 ppb.

Total % breakdown for Endrin may not exceed 15%, and total % breakdown for 4,4'-DDT may not exceed 15%. Combined % breakdown for Endrin and 4,4'-DDT may not exceed 30%.

$$\text{Calculation} = \frac{(\text{instr val E. Ald.} + \text{instr val E. Ket.})100\%}{(\text{instr val E.} + \text{instr val E. Ald.} + \text{instr val E. Ket.})}$$

$$\text{Calculation} = \frac{(\text{instr val DDD} + \text{instr val DDE})100\%}{(\text{instr val DDT} + \text{instr val DDD} + \text{instr val DDE})}$$

9.9.3 BS/BSD: True Value γ-BHC, Heptachlor, Aldrin = 25 ppb.

$$\text{Calculation} = \frac{(\text{instrument value})100\%}{25\ \text{ppb}}$$

True Value Dieldrin, Endrin, 4,4'-DDT = 50 ppb.

$$\text{Calculation} = \frac{(\text{instrument value})100\%}{50\ \text{ppb}}$$

9.9.4 MS/MSD: True Value γ-BHC, Heptachlor, Aldrin = 25 ppb.

$$\text{Calculation} = \frac{(\text{MS value} - \text{sample value})100\%}{25\ \text{ppb}}$$

True Value Dieldrin, Endrin, 4,4'-DDT = 50 ppb.

$$\text{Calculation} = \frac{(\text{MS value} - \text{sample value})100\%}{50 \text{ ppb}}$$

9.9.5 Relative percent difference (RPD):

$$\text{Calculation} = \frac{(\text{spike value 1} - \text{spike value 2})100\%}{(\text{spike value 1} + \text{spike value 2})/2}$$

*All acceptance limits in document CLS Labs LCS/LCSD MS/MSD CONTROL LIMITS. This document is located in the GC/NV laboratory, next to the data entry PC. A copy may also be obtained from the QA/QC supervisor. If any spikes or surrogates are out of the limits posted in this document, refer to Table 8-1.

10.0 DOCUMENTATION

10.1 The following documents must be included, in order, in all data folders, before being submitted for review:

1. Extraction QC Batch summary with spike id's, sample volumes, and extraction date.
2. Endrin/DDT Breakdown Forms (page 16)
3. Copy of hand written instrument run log.
4. Copy of current ICV Table, copies of all CCV chromatograms, any other standard chromatograms that are requested by client.
5. Copies of the QC samples for the batch that the sample was analyzed with, including chromatograms.
6. Copies or original chromatograms of all samples.
7. A copy of the original work order for the samples.
8. Any client specific QC checklists that may apply.

10.2 Include a copy of all the raw calibration data (chromatograms, response area, factors, etc.) in the folder for the first job in the instrument run.

11.0 REFERENCES

11.1 SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Revision 3, December 3, 1996, Office of Solid Waste and Emergency Response, U.S. EPA, Washington, DC.

11.2 Model HP 6890 Gas Chromatograph Operation and Maintenance Manual, Hewlett-Packard Corp., Palo Alto, CA

11.3 Appendix C, "Sample Collection and Transport", and Appendix D, "Analytical Procedures", Leaking Underground Fuel Tank Manual, State of California LUFT Task Force, October 1989

Extraction Flow Chart

EPA Method 8081A
Mass of soil 30g Na_2SO_4
Add appropriate surrogates and perform spikes.
Add 60mL $MeCl_2$
Extract 3X $MeCl_2$
Decant thru Na_2SO_4 into KD apparatus
Conc. to approx. 4mL. Add approx. 10mL Hexane
Raise water bath temp. and conc. to approx. 2 mL
Adjust final vol. to 5 mL in Hexane
Ready for GC Analysis

Table 8-1
SUMMARY OF QUALITY CONTROL PROCEDURES

ethod	Parameter	QC Performed	Frequency	Acceptance Criteria	Corrective Action
rganic					
	QC Check Sample		1 time per life of method	Recovery must be within limits as specified in the individual methods in SW846	Correct problem and rerun complete QC check.
	Initial Calibration		Initially and as required.	$r^2 \geq 0.995$ or RF< 20%	1) Evaluate system. 2) Reanalyze standards. 3) Recalibrate if appropriate.
	ICV, CCV, and FCV		Daily before, during and after sample analysis	± 15%	1) Determine cause. 2) Recalibrate. 3) Rerun samples.
	Retention Time Windows		Initially updated by mid-point once/day.	± 0.050minute from ICV	1) Determine the problem. 2) Rerun if necessary.
		Method blank	1 per batch.	The highest of: ≤ Detection Limit or 5% of Regulatory limit or 5% of measured concentration in the sample.	1) Determine the problem. 2) Report to supervisor. 3) Rerun if necessary. 4) Still fails, corrective action.
		Matrix spike (MS)	1 per batch	See CLS Labs LCS/LCSD MS/MSD CONTROL LIMITS document.	1) Evaluate system. 2) Check calculations. 3) Check instrument 4) Check extraction. 5) If problem re-extract and re-analyze . 6) Check BS/BSD. 7) If BS/BSD is with in limits consider test under control, add qualifier for MS that exceeded limits, complete analysis write up. 8) If BS/BSD isn't with in limits, problem not resolved. Once BS/BSD is within limits: 1) Report to supervisor, add qualifier, and give probable reason for non-conformance.
		Matrix spike duplicate (MSD)	1 per batch samples	Same as matrix spike.	Same as Matrix Spike
		Surrogate spikes	Every sample, method blank, and standard.	See CLS Labs LCS/LCSD MS/MSD CONTROL LIMITS document.	1) Check calculations; if errors recalculate. 2) Check instrument performance. If instrument problem, correct, reanalyze and the extract. 3) If upon re-analysis the recovery is not within limits, report situation to supervisor, add qualifier.
		Blank Spike(BS)	1 per batch.	See CLS Labs LCS/LCSD MS/MSD CONTROL LIMITS document	1) Evaluate system. 2) Check calculations. 3) Check instrument. 4) Rerun extract 5) If problem re-extract and analyze. 6) Report to supervisor.

Blank Spike Duplicate(BSD)	1 per batch.	Same as Blank Spike(BS)	Same as Blank Spike(BS).
Duplicates	As contract-required	± 20% or as contract specified.	Same as Matrix Spike.
Trip Blanks	As contract-required	Same as method blank.	Same as Method Blank.

Method 8081A GC Analysis
Pesticide Degradation Breakdown Form

%Breakdown of DDT = (ng DDD + ng DDE) x 100
ng DDT injected

breakdown for 4,4' DDT = (DDE)____ + (DDD)____ divided by
(DDT)____ + (DDE)____ (DDD)_____
x 100 = 4,4'-DDT % breakdown____

%Breakdown of Endrin (E) = (ng Endrin aldehyde + ng Endrin ketone) x 100
ng Endrin injected

breakdown for Endrin (E) = (E-aldehyde)____ + (E-ketone)____ divided by
(E)____ + (E-aldehyde)____ (E-ketone)_____
x 100 = Endrin % breakdown____

Combined %Breakdown = %Breakdown DDT + %Breakdown Endrin

4,4' DDT breakdown must be less than or equal to 15.0 %

Endrin breakdown must be less than or equal to 15.0 %

Combined breakdown must be less than or equal to 30.0 %

If above limits are exceeded, a corrective action form must be filled out and the problem addressed.

APPENDIX G

TRANSPORTATION PLAN

TRANSPORTATION PLAN

REMOVAL ACTION WORKPLAN

PENRYN PROPERTY

Penryn, California

WKA No. 5887.06

Prepared for:

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3990 Ruffin Road, Suite 100
San Diego, California 92123

Prepared By:

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INTRODUCTION

This Transportation Plan has been prepared in conjunction with the Removal Action Workplan (RAW) requirements intended to address the removal of risks to human health and the environment posed by the presence of soil impacted primarily with elevated concentrations of arsenic, and secondary impacts from lead, and organic pesticides on the proposed Penryn Property (herein referred to as site). The purpose of this Transportation Plan is to minimize potential health, safety, and environmental risks resulting from the movement of material and/or equipment during site cleanup. Our objective is the performance of the proposed work tasks in a manner that provides efficient use of time and resources and ensures the safety of site workers and the public.

This workplan proposes the excavation and disposal of primarily arsenic-impacted soil from three site areas together comprising slightly over 6 acres.

The site consists of approximately 15-acres located southeast of Taylor Road and west of Penryn Road in Penryn, Placer County, California. The site is presently undeveloped and the majority of its surface is covered with a moderate to dense growth of green and dried grasses, weeds, and brush, as well as numerous evergreen and deciduous trees, including some native oaks. Several dirt roads and a South Placer Municipal Utility District (SPMUD) sewer easement are present on-site.

Previous site studies included two Phase I ESAs conducted separately for the Chavez and Mott Property, and three additional studies confirming and spatially delineating the presence and extent of impacted soil areas warranting cleanup action. These studies are discussed in more detail in the body of the RAW.

SPECIFIC CLEANUP ACTION TASKS

Specific cleanup action tasks proposed in the removal action will include the following:

Excavation: Figure 6 in the RAW illustrates the location of the mitigation areas, showing the horizontal distribution of contaminants exceeding established cleanup goals. These horizontal distributions, shown as Mitigation Areas 1 through 3, illustrate the perimeters of the planned excavation areas. All three mitigation areas comprise approximately 7.11 acres (310,000 ft^2) of lateral surface extent. The estimated volume of soil (with 15% contingency) to be removed to ensure cleanup objectives is approximately

11,600 cubic yards (~15,060 tons). Actual volume may vary due to varying depth of underlying bedrock. Table 9, in the RAW, contains a summary of each proposed mitigation area excavation with dimensions and volumes.

Equipment use in the excavation and loading of impacted soil may include scrapers, motor graders, an excavator (for truck loading), and a water tanker truck. Equipment will meet or exceed federal EPA emissions requirements for Tier 3 new, non-road, diesel engines.

During, and at the end of site cleanup activities, all equipment and vehicles will be cleaned to the extent that no potentially contaminated soil will be inadvertently carried off site in an uncontrolled manner.

Stockpile Characterization: As the impacted material is excavated, it will be stockpiled on plastic sheeting in designated areas and immediately covered with plastic sheeting secured with sandbags to prevent wind erosion or contact with direct precipitation.

Pending required waste disposal characterization, the stockpiled soil will be transported as a Class II waste under waste manifest protocol.

Transportation: Procedures for transportation of soil removed from the site will include transportation by an approved, properly licensed, trucking contractor. Personnel transporting wastes off site will be trained in accordance with 49 USC Section 1805(b) and 29 CFR 1910. Waste will be transported utilizing DOT-approved shipping containers in accordance with 49 CFR Parts 171, 172, 173, 177, 178, 179 and other applicable local, state, and federal transportation guidelines. Haulers will follow all applicable requirements in 49 CFR Parts 174 through 177 with regard to loading, unloading, and general handling based on transport mode. Site access details and proposed movement of trucks both within, and to and from the site, will be provided in a Revised RAW following consultation with the selected cleanup contractor and decisions pertaining to allowable land modification. The preferred site entry and egress will likely be onto Penryn Road bordering the east site perimeter.

Trucks will be weighed on-site using either axle scales attached to the vehicles or rollover scales. Once filled, trucks will be covered with a permanent fixed cover, tarpaulin or other means to prevent fugitive dust. Each truck will be visually inspected for proper

loading, covering/sealing, decontamination, placarding and manifesting prior to leaving the site.

Bulk solid debris will be removed from each truck by scraping with shovels or other implements prior to leaving the site. Where necessary, trucks will be pressure-washed prior to exiting the site. A truck decontamination area will be prepared near the site entrance. Any rinse water produced will be collected and retained in drums or other approved container type(s) for analysis and disposal. (Pressure washing will only be used if other methods are not sufficient, as this method requires containing wash liquids in approved containers for disposal).

All material will be shipped under the appropriate waste documentation manner. Records of all waste material hauled off site will be maintained in the project files. These and requirements for hazardous wastes (not pertinent to the anticipated non-hazardous waste stream) are described below.

- Vehicles will have passed an annual inspection.
- Vehicle Operators will be trained in the safe handling of the waste.
- Haulers will maintain the ability to pay damages caused by their operations through proper insurance coverage.
- Haulers will have licenses issued by the California Highway Patrol (CHP) for transportation of hazardous materials.
- Haulers will have an EPA identification number.
- Haulers will comply with the Uniform Hazardous Waste Manifest System.
- Haulers will take certain actions in response to hazardous waste discharges during transport (i.e. covering the load to prevent the discharge of dust/particulates into the atmosphere during hauling).

Waste Placarding

Vehicles transporting hazardous wastes will be placarded according to DOT requirements. The appropriate placard will be selected based on its hazard class specified in 49 CFR Part 173. Containers will be labeled as specified 49 CFR 172.102 Subpart E.

Waste Documenting Procedures

A field logbook will be maintained during the removal action activities. The date, time, weight/volume, trucking company, drive, and vehicle used for each trip will be gathered and maintained in the logbook. This logbook will additionally serve to document observations, personnel onsite, equipment arrival, and departure times, a truck exit inspection checklist and other project information.

Field logbooks will document where, when, how, and from whom any vital project information is obtained. Logbook entries will be complete and accurate enough to permit reconstruction of field activities. Logbooks will be bound with consecutively numbered pages. Each page will be dated and the time of entry notice in military time. All entries will be legible, written in black ink, and signed by the individual making the entries. Language will be factual, objective, and free of personal opinions or inappropriate terminology. If an error is made, corrections will be made by crossing a line through the error and entering the correct information. Corrections will be dated and initialed. No entries will be obliterated or otherwise rendered unreadable.

Entries in the field logbook will include at a minimum the following for each fieldwork date:

- Site name and address
- Recorder's name
- Team members and their responsibilities
- Time of site arrival/entry on site and time of site departure
- Other personnel onsite
- A summary of any onsite meetings
- Description of excavation machinery
- Description of transport vehicle(s)
- Quantity of excavated soils in truckloads (approximate percentage of full load)
- Names of waste transporters and proposed disposal facilities
- Copies of numbers of manifests or other shipping documents
- Quantity of import fill material in truckloads
- Deviations from this RAW and site HASP
- Changes in personnel and responsibilities as well as reasons for the changes
- Levels of safety protection
- Calibration readings for any equipment used and equipment model and serial number

Disposal: The transport vehicles will transport the waste material to one of the following Class II landfills:

Norcal Waste Systems
Ostrom Landfill, Inc.
5900 Ostrom Road
Wheatland, California 95692
Class II waste landfill
USEPA ID# 110017973022
SWIS ID# 58-AA-0011

Facility Contact
Paul Gamble
Norcal Waste Systems, Ostrom Road LF, Inc.
235 North First St.
Dixon, CA 95620
Phone: (916) 525-1006

Or alternatively:

Western Placer Waste Management Authority
Western Regional Landfill
3195 Athens Avenue
Lincoln, Ca 95648
USEPA ID# 110017972988
SWIS ID# 31-AA-0210

Facility Contact
Eric Oddo
Phone (916) 916-3984

Each truckload will be weighed at the disposal facility to determine final load quantity.

Disposal Route
The final disposal route will be determined following landfill selection and acceptance. Alternative sites with two (one primary, one potential) routes for each are shown in Appendix G-1 of this Transportation Plan.

The Ostrom Landfill is located approximately 34.6 miles from the subject property. Estimated drive time is 47 minutes one-way. There are no weigh stations along the proposed disposal route. Peak time (rush hour) traffic hours are generally between 6:00

and 8:00 am, and 4:00 and 6:00 pm. During these times the primary route may take as much as 25 minutes more in the morning moving towards the landfill (due to off ramp congestion at Highway 80/65 and travel time through the Town of Lincoln), and 20 minutes more returning to the site. In the afternoon the route may take approximately the same time.

The Western Regional Landfill is located approximately 15.5 miles from the subject property. Estimated drive time is 21 minutes one-way. There are no weigh stations along the proposed disposal route. Peak time (rush hour) traffic hours are generally between 6:00 and 8:00 am, and 4:00 and 6:00 pm. During these times the primary route may take as much as 15 minutes more in the morning moving towards the landfill (due to off ramp congestion at Highway 80/65), and 15 minutes more returning to the site. In the afternoon the route may take approximately the same time.

CHARACTERISTICS OF WASTE/MATERIAL

Arsenic impacted soil to be transported consists of generally brown sandy silt and silty clay, to clayey, silty sands. These soils do not show visual evidence of the contamination detected by laboratory analyses. Concentrations of contaminants in soil exceed human health screening levels but do not meet the definition of hazardous materials or waste.

CONTAMINANT HEALTH EFFECTS

Arsenic, Lead and DDT and its congeners strongly adsorb to soil particles. This affinity combined with generally low water solubility of these compounds means that leaching is generally limited in soil [reference the Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile for Arsenic* (1993), *Toxicological Profile for DDT & Congeners* (1993), and *Toxicological Profile for Lead* (1994), U.S. Dept. of Health and Human Services, Public Health Services, as well as the *Hazardous Substances Databank* (2000), National Library of Medicine, Toxicology Data Network]. The mobility of persistent pesticide residuals through soils is minimal unless large quantities are concentrated in a small, unreactive soil [reference *Soil Chemistry* (1987), by H. L. Bohn et al, John Wiley & Sons, New York City] area such as might be the case for industrial waste disposal areas, or in areas of very coarse soils. The following descriptions of contaminant health effects are derived primarily from the preceding ATSDR reference.

Lead is a bio-accumulative substance and a reproductive and developmental toxin. Lead poisoning is one of the most commonly reported occupational diseases among adults, resulting primarily from inhalation of dust or fumes. Lead targets the nervous system, affecting hearing, vision, and muscle control. It is toxic to lungs, kidneys, blood, and heart. Most likely exposure pathways include ingestion and inhalation. Symptoms develop more quickly through inhalation exposure than ingestion because absorption takes place most quickly through the respiratory tract. Acute lead poisoning is most common in children with history of pica (an eating disorder in which a person repeatedly eats non-food items); symptoms include anorexia, vomiting, malaise, and convulsions due to increased intracranial pressure, which may lead to permanent brain damage. Exposure in children can cause irreversible learning deficits, mental retardation, weight loss, weakness, anemia, cognitive dysfunction, and delayed neurological and physical development.

Arsenic is usually found in the environment combined with other elements. Arsenic combined with such elements as oxygen, chlorine, and sulfur is called inorganic arsenic. Arsenic combined with carbon and hydrogen is referred to as organic arsenic. The difference between inorganic and organic arsenic is important because the organic forms are usually less harmful than the inorganic forms. Most likely exposure pathways include ingestion, absorption and inhalation. Swallowing arsenic has been reported to increase the risk of cancer in the liver, bladder, kidneys, prostate, and lungs. The Department of Health and Human Services (DHHS) has determined that inorganic arsenic is a known carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans. Both the EPA and the National Toxicology Program (NTP) have classified inorganic arsenic as a known human carcinogen.

Although the more water soluble arsenic compounds are generally more toxic and more likely to have systemic effects, the less soluble compounds are more likely to cause chronic pulmonary effects if inhaled. General non-carcinogenic symptoms of chronic arsenic poisoning are weakness, general debility and lassitude, loss of appetite and energy, loss of hair, hoarseness of the voice, loss of weight, and mental abnormalities (Hindmarsh and McCurdy, 1986). Skin, neurological, and vascular disorders are the most common effects seen following long-term exposures.

Pesticide compound **DDT** (1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane) does not occur naturally in the environment DDT is a synthetic, chlorinated hydrocarbon insecticide with

broad-spectrum insecticidal potential. Technical grade DDT may also contain DDE (1,1-dichloro-2,2-bis(*p*-chlorophenyl) ethylene) and DDD (1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethane) as contaminants. Both **DDE** and **DDD** are breakdown products of DDT. The EPA banned all uses of DDT in 1972, except in cases of public health emergencies. DDT was banned because the chemical was building up in the environment and affecting wildlife. Also, some cancer tests in laboratory animals showed positive results.

Most likely exposure pathways include ingestion, absorption and inhalation. Ingestion of large amounts (grams) of DDT over a short time would most likely affect the nervous system. Studies in animals have shown that oral exposure to DDT can cause liver cancer. Studies of DDT-exposed workers did not show increases in deaths or cancers. Based on all of the evidence available, the Department of Health and Human Services has determined that DDT is reasonably anticipated to be a human carcinogen. Similarly, the International Agency for Research on Cancer (IARC) has determined that DDT is possibly carcinogenic to humans. EPA has determined that DDT, DDE, and DDD are probable human carcinogens.

Endrin is a solid, white, almost odorless substance that does not occur naturally in the environment. It was used as a pesticide to control insects, rodents, and birds. The most likely exposure pathways include ingestion, absorption and inhalation. Exposure to endrin can cause various harmful effects including death and severe central nervous system (brain and spinal cord) injury. No long-term health effects have been noted in workers who have been exposed to endrin by breathing or touching it. The EPA has determined that endrin is not classifiable as to its human carcinogenicity because there is not enough information to allow classification. Endrin was banned for public health reasons, and has not been produced or sold for general use in the United States since 1986.

Methoxychlor is a manufactured chemical that does not occur naturally in the environment. Pure methoxychlor is a pale-yellow powder with a slight fruity or musty odor. Methoxychlor is used as an insecticide against flies, mosquitoes, cockroaches, chiggers, and a wide variety of other insects. It is used on agricultural crops and livestock, and in animal feed, barns, grain storage bins, home garden, and on pets. Methoxychlor is also known as DMDT, Marlate®, or Metox®. Most likely exposure pathways include ingestion, absorption and inhalation.

There is very little information on how methoxychlor can affect people's health. Animals exposed to very high amounts of methoxychlor suffered tremors and convulsions and seizures. Because methoxychlor is broken down quickly in the body, you are not likely to experience these effects unless you are exposed to very high levels.

Animal studies show that exposure to methoxychlor in food or water harms the ovaries, uterus, and mating cycle in females, and the testes and prostate in males. Fertility is decreased in both male and female animals. These effects can occur both in adult and in developing animals and could also occur following inhalation or skin contact. These effects are caused by a breakdown product of methoxychlor which acts as a natural sex hormone. These effects have not been reported in humans, but they could happen.

Most of the information available from human and animal studies suggests that methoxychlor does not cause cancer. The International Agency for Research on Cancer (IARC) and the EPA have determined that methoxychlor is not classifiable as to its carcinogenicity to humans.

SITE SPECIFIC CHARACTERISTICS

The lateral surface extent of impacted soil is approximately 7.11 acres (310,000 ft^2) total area distributed between the three mitigation areas shown in Figure 6 of the RAW. Individual mitigation area measurements and volumes are included in Table 9 of the RAW. Presuming a scaling depth of one foot plus a 15% contingency factor, the expected overall volume of soil to be removed to ensure cleanup objectives is estimated as approximately 11,600 cubic yards.

TRAFFIC CONTROL

Vehicles will enter and exit the site from Penryn Drive on the east, proceeding into the site westward as shown on the Figure G-1. Flagmen will be required at the point of site egress at the moment trucks exit the site property onto Penryn Drive to ensure that no danger to or from oncoming traffic is imminent. Because there is ample open area within the site, adjacent to excavation areas, we anticipate that truck staging will occur onsite, close to the excavation activities.

Vehicle idling time within the staging areas along Penryn Road and on-site will be kept to a minimum (approximately three minutes) to limit air emissions. Two proposed

disposal routes, showing likely routes from the site to one of two likely landfills, are shown in Appendix G-1. These route selections were chosen to best minimize interference with local traffic and proximity to populated areas and sensitive receptors.

Between twenty to forty truckloads of soil will be transported per day (approximately 360 to 720 tons) depending on the number of trucks available. Approximately 644 truckloads will be required in total. Therefore we anticipate approximately two to three and a half weeks will be required to complete the soil transportation.

As much as possible we will plan to avoid moving trucks through urban areas during peak traffic hours.

In the event of encountering potentially hazardous road conditions (e.g. – accident sites, inclement weather, nightfall or other cause of restricted visibility) alternate routes may be used, or transport will be delayed. Truck drivers will be in direct radio communication with their dispatchers. In the event of equipment failure or other contingency, the dispatcher will contact the most appropriate source of aid.

RECORD KEEPING

Waste transportation will nevertheless comply with the California Vehicle Code (CVC), CHP Regulations (13 CCR); the California State Fire Marshal Regulations (19 CCR); and United States Department of Transportation (DOT) Regulations, Title 49, Code of Federal Regulations (49 CFR), the California Health and Safety Code (HSC) and 22 CCR. These requirements include keeping of appropriate records during transportation activities, including the provisions that:

- the transporter will have proof of valid registration as a hazardous waste transporter (HSC Section 25163) on the transporting vehicle; and

- a bill of lading properly completed and signed by the generator and the transporter (22 CCR Section 66263.20(a)).

    - o the bill of lading will identify the date, time, weight/volume, waste/material, transporting company, driver, and vehicle for each trip made;
    - o the driver will have a manifest in his or her possession while transporting the hazardous waste (HSC Section 25160(d)(1));

- the generator will retain a copy of the manifest of every truckload leaving the site.

A summary of the analytical results representing the load, and maps showing the proposed route to the disposal facility will accompany each truckload.

As the waste to be transported is not a hazardous waste, a Uniform Hazardous Waste Manifest should not be required.

Note: California Senate Bill 1257 became a law on January 1, 2003. This new law requires that drivers must open the doors at the direction of a peace officer, an authorized employee of the California Highway Patrol (CHP), the DTSC, Certified Unified Program Agencies, and local health officers. The law also requires working two-way communications devices in all vehicles used for the transportation of hazardous wastes or hazardous materials.

HEALTH AND SAFETY

All contractors will be responsible for operating in accordance with the most current Occupational Safety and Health Administration (OSHA) regulations including 29 CFR 1910.120 and CCR Title 8, Section 5192, Hazardous Waste Operations and Emergency Response (HAZWOPR), and 29 CFR 1926, Construction Industry Standards, as well as other applicable federal, state, and local laws and regulations. All personnel on site during remediation will have the current documentation of annual occupational health physical examinations and 8-hour HAZWOPR training. In accordance with the Health & Safety Plan (HASP) (Appendix D the RAW) the required personal protective devices must be immediately available on site.

The excavation equipment operator(s) will have a Class A hazardous materials license and hold a current 40-hour hazardous materials training certificate plus 8-hour annual HAZWOPR training. All personnel on site during remediation will have the current documentation of annual occupational health physical examinations and 8-hour HAZWOPR training. In accordance with the appended HASP (Appendix D), the required personal protective devices will be immediately available on site.

During excavation and loading activities workers will utilize Level D personal protection equipment (PPE). Gilian air Sampling constant flow air sampling pump or similar device

will be set up in the down wind direction to ensure a safe working environment and the safety of nearby communities. The OSHA Recommended Exposure Level (REL) for arsenic (10-hour TWA) is 0.500 mg/m^3. This value will be used as a fence line action level and a trigger to cease excavation and loading activities.

The HASP (included within Appendix D of the RAW) will be provided to each on-site contractor and communicated via tailgate safety meetings to all drivers and on-site workers by the site safety officer (SSO). This Plan contains contaminant descriptions, hazard analysis, and requirements for the containment and cleanup of an accidental release along with basic safety requirements, personnel in charge, contact information and a map and directions to the nearest hospital. The SSO will be responsible for reviewing the HASP with the on-site workers prior to commencing work.

Transportation

Truck drivers will be required to carry a copy of the HASP in their vehicles during material transport, and will be adequately trained and equipped to implement the requirements of the Plan. An analytical description of the load material and maps showing the proposed route to the disposal facility will accompany each truckload.

The trucks will also be appropriately placarded according to waste code. The CHP will be notified of our impending action prior to transportation. In the event of an off-site release or accident involving the transported material, we will immediately notify the CHP and other appropriate local entities.

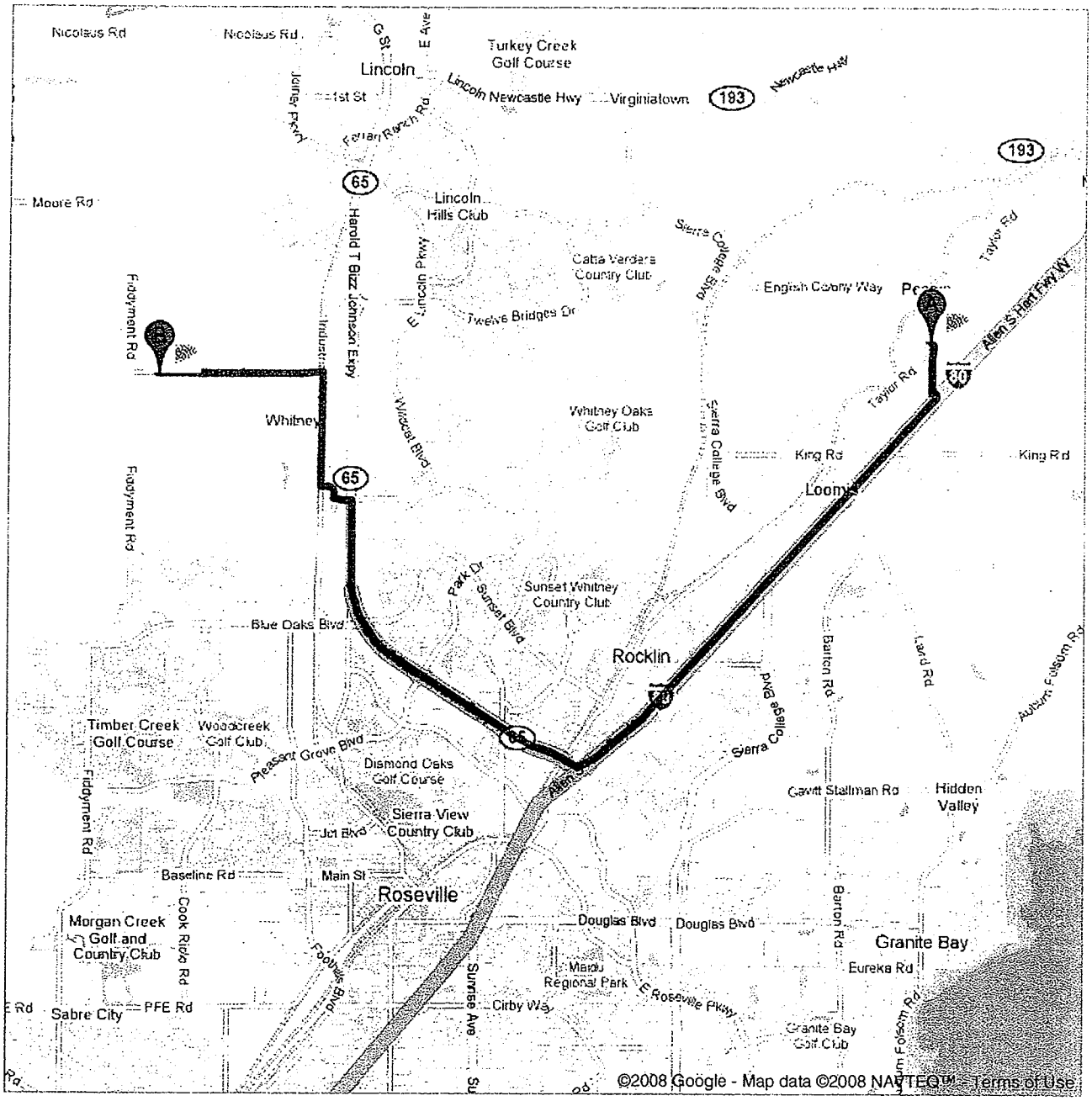
APPENDIX G-1

DISPOSAL ROUTE

Google Maps

Start **Taylor Rd & Penryn Rd**
Penryn, CA 95663
End **3195 Athens Ave**
Lincoln, CA 95648
Travel **15.5 mi – about 21 mins**

Notes Western Placer Waste Management Authority



Taylor Rd & Penryn Rd
Penryn, CA 95663

Drive: 15.5 mi – about 21 mins

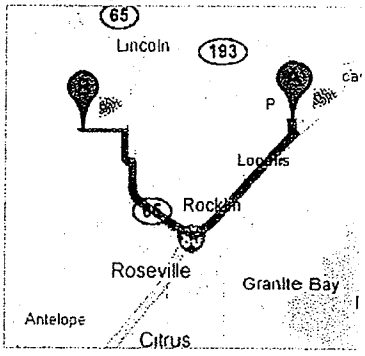
1.	Head **southeast** on **Penryn Rd** toward **Penryn Estates Dr**	0.6 mi 1 min
2.	Turn **left** to merge onto **I-80 W** toward **Sacramento**	6.1 mi 7 mins
3.	Take the exit onto **CA-65 N** toward **Marysville/ Lincoln**	4.9 mi 5 mins
4.	Turn **left** at **Sunset Blvd**	0.2 mi 1 min
5.	Turn **right** at **Placer Corp Dr**	0.3 mi 1 min
6.	Turn **right** at **Industrial Ave**	1.4 mi 3 mins
7.	Turn **left** at **Athens Ave**	2.0 mi 4 mins

3195 Athens Ave
Lincoln, CA 95648

These directions are for planning purposes only. You may find that construction projects, traffic, or other events may cause road conditions to differ from the map results.

Map data ©2008 NAVTEQ™

Overview



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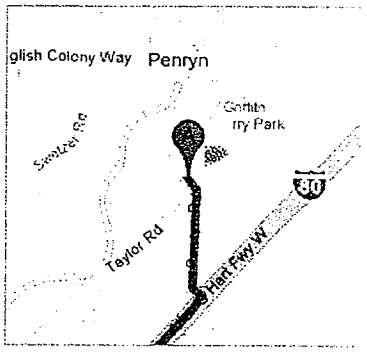

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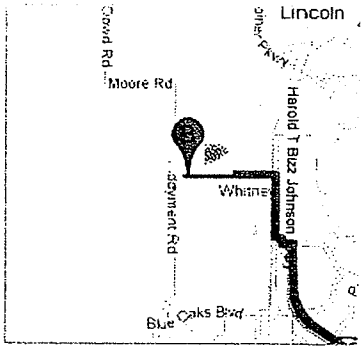
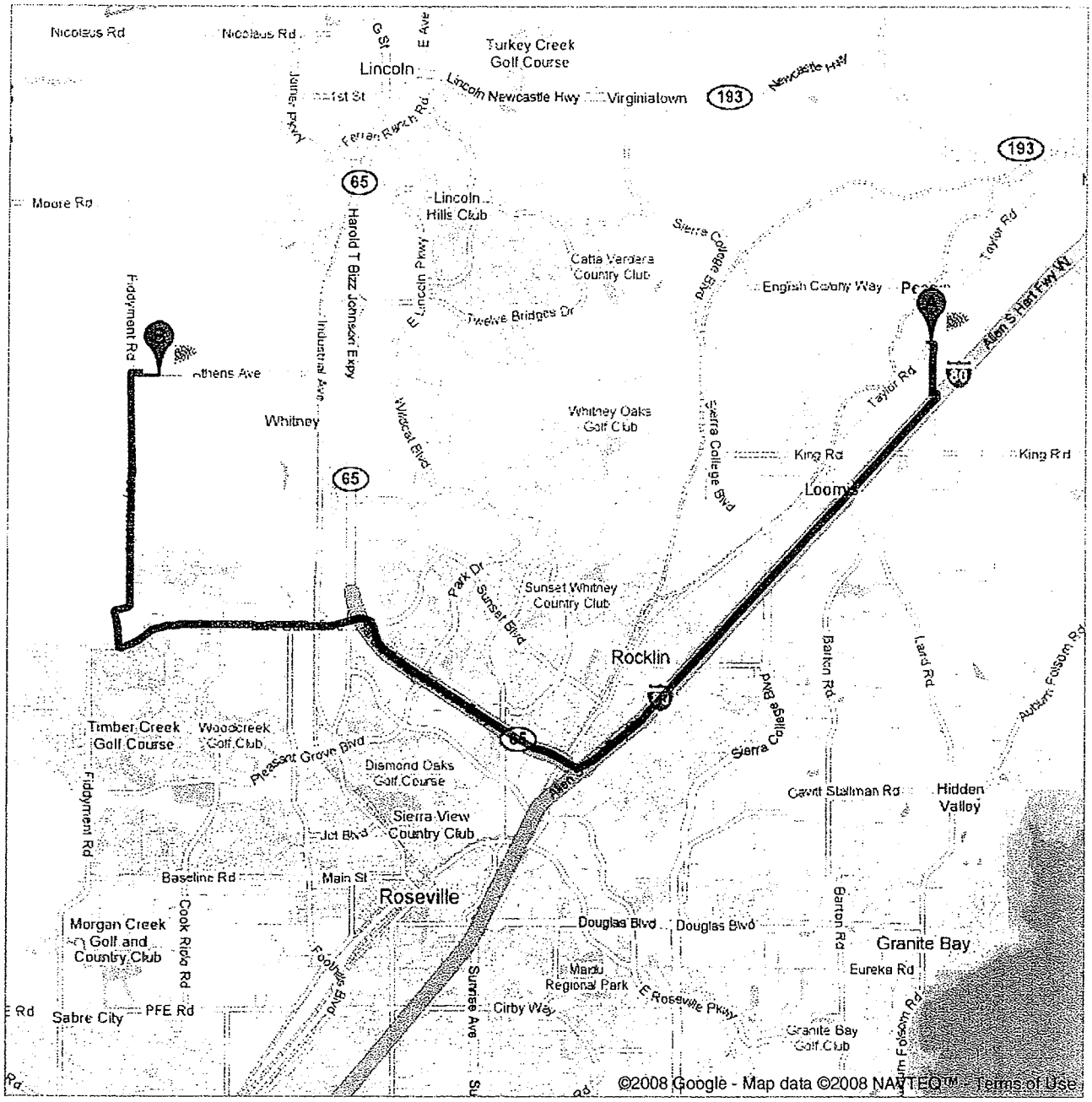


Map data ©2008 NAVTEQ™

Google Maps

Start **Taylor Rd & Penryn Rd**
Penryn, CA 95663
End **3195 Athens Ave**
Lincoln, CA 95648
Travel **17.0 mi – about 24 mins**

Notes Western Placer Waste Management Authority



Taylor Rd & Penryn Rd
Penryn, CA 95663

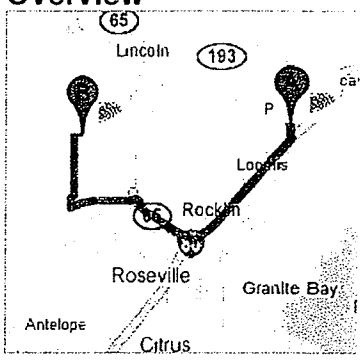
Drive: 17.0 mi – about 24 mins

1.	Head **southeast** on **Penryn Rd** toward **Penryn Estates Dr**	0.6 mi 1 min
← 2.	Turn **left** to merge onto **I-80 W** toward **Sacramento**	6.1 mi 7 mins
3.	Take the exit onto **CA-65 N** toward **Marysville/ Lincoln**	3.0 mi 3 mins
4.	Take the exit toward **Washington Blvd/Blue Oaks Blvd**	0.2 mi
→ 5.	Keep **right** at the fork, follow signs for **Blue Oaks Blvd W** and merge onto **Blue Oaks Blvd**	3.4 mi 6 mins
→ 6.	Turn **right** at **Fiddyment Rd**	3.4 mi 6 mins
→ 7.	Turn **right** at **Athens Ave**	0.3 mi

3195 Athens Ave
Lincoln, CA 95648

These directions are for planning purposes only. You may find that construction projects, traffic, or other events may cause road conditions to differ from the map results.

Overview



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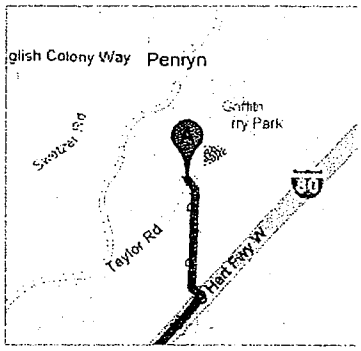

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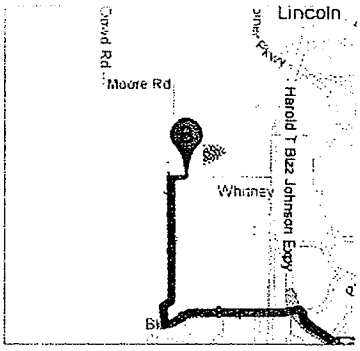
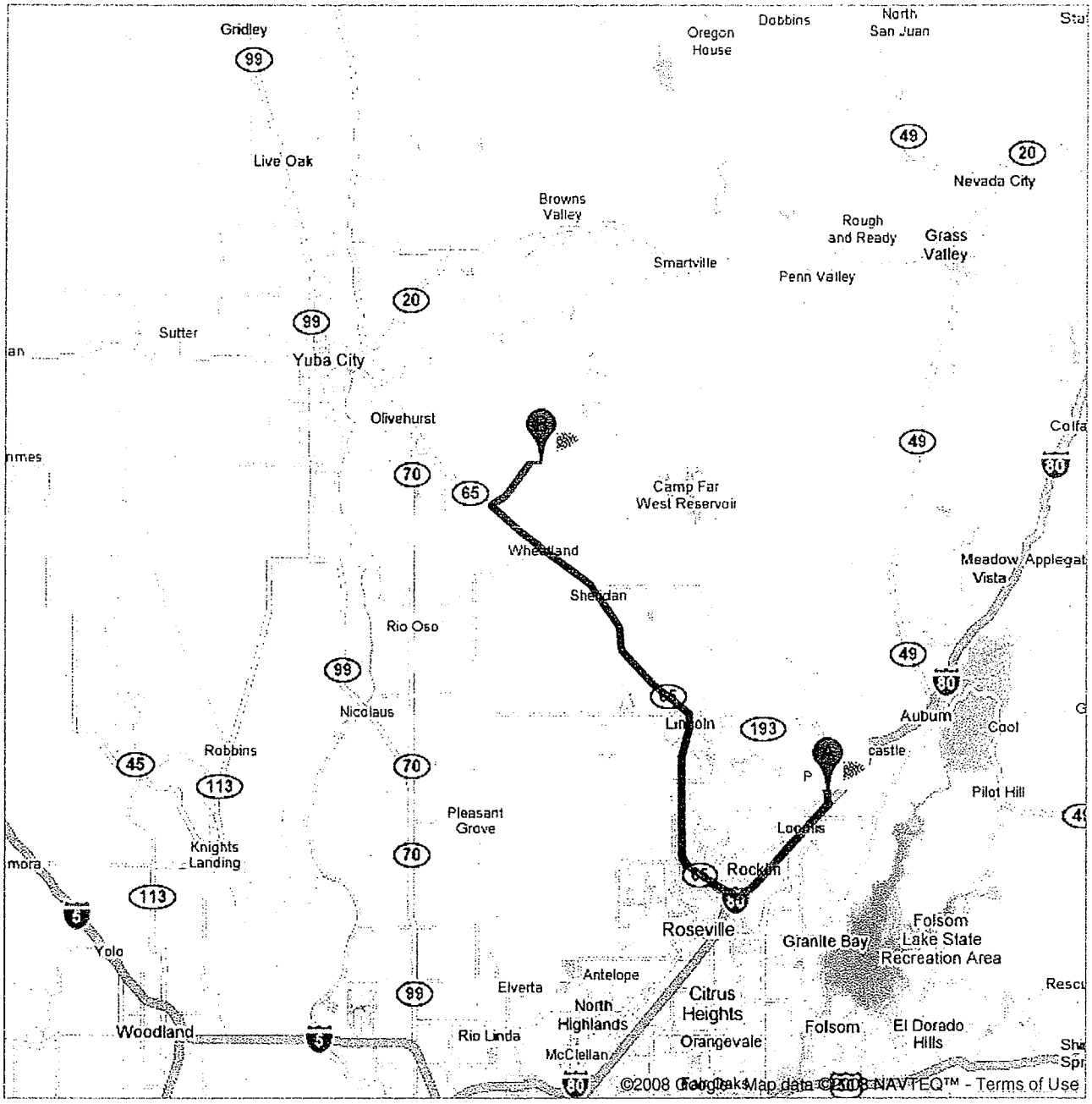


Google Maps

Start **Taylor Rd & Penryn Rd**
Penryn, CA 95663
End **Ostrom Rd**
Wheatland, CA 95692
Travel **34.6 mi – about 47 mins**

Notes Ostrom Landfill



Taylor Rd & Penryn Rd
Penryn, CA 95663

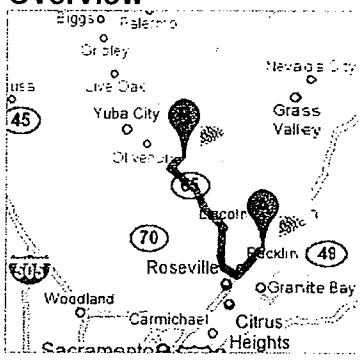
Drive: 34.6 mi – about 47 mins

1.	Head **southeast** on **Penryn Rd** toward **Penryn Estates Dr**	0.6 mi 1 min
← 2.	Turn **left** to merge onto **I-80 W** toward **Sacramento**	6.1 mi 7 mins
3.	Take the exit onto **CA-65 N** toward **Marysville/ Lincoln**	24.6 mi 31 mins
→ 4.	Turn **right** at **S Beale Rd**	2.9 mi 8 mins
→ 5.	Turn **right** at **Ostrom Rd**	0.3 mi 1 min

Ostrom Rd
Wheatland, CA 95692

These directions are for planning purposes only. You may find that construction projects, traffic, or other events may cause road conditions to differ from the map results.

Overview



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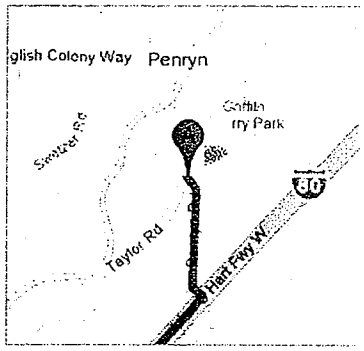

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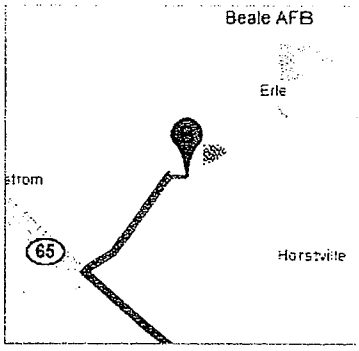
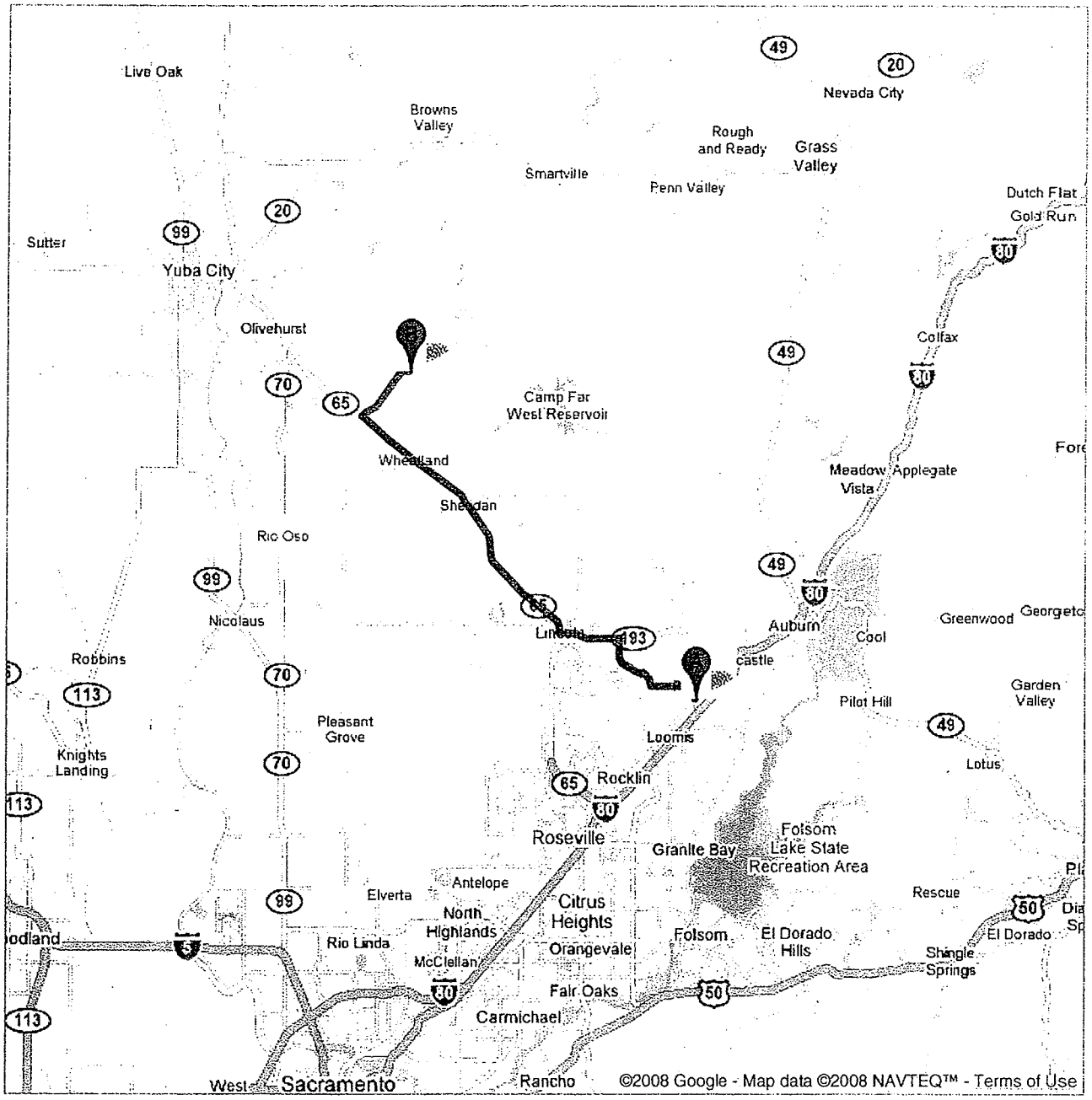


Google Maps

Start **Taylor Rd & Penryn Rd**
Penryn, CA 95663
End **Ostrom Rd**
Wheatland, CA 95692
Travel **27.1 mi – about 42 mins**

Notes Ostrom Landfill



Taylor Rd & Penryn Rd
Penryn, CA 95663

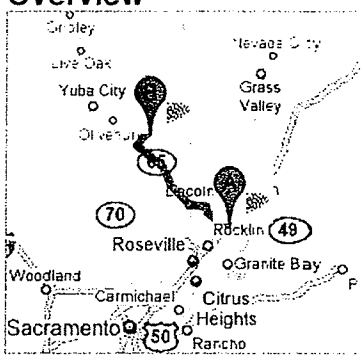
Drive: 27.1 mi – about 42 mins

1.	Head **northeast** on **Taylor Rd** toward **Penryn Rd**	0.5 mi 1 min
← 2.	Turn **left** at **English Colony Way**	3.4 mi 7 mins
→ 3.	Turn **right** at **Sierra College Blvd**	2.3 mi 3 mins
← 4.	Turn **left** at **CA-193**	3.0 mi 6 mins
→ 5.	Turn **right** at **CA-65**	14.6 mi 17 mins
→ 6.	Turn **right** at **S Beale Rd**	2.9 mi 8 mins
→ 7.	Turn **right** at **Ostrom Rd**	0.3 mi 1 min

Ostrom Rd
Wheatland, CA 95692

These directions are for planning purposes only. You may find that construction projects, traffic, or other events may cause road conditions to differ from the map results.

Overview



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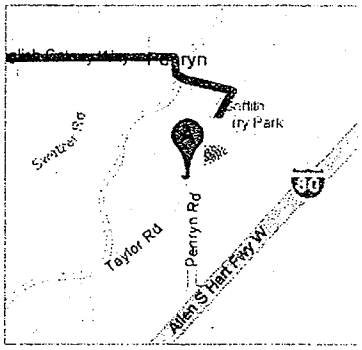

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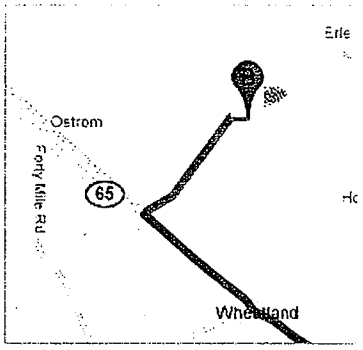

APPENDIX H

EROSION PREVENTION AND SEDIMENT CONTROL PLAN

EROSION PREVENTION AND SEDIMENT CONTROL PLAN

REMOVAL ACTION WORKPLAN

PENRYN PROPERTY

Penryn, California

WKA No. 5887.06

Prepared for:

Penryn Development, LLC
3990 Ruffin Road, Suite 100
San Diego, California 92123

Prepared By:

Wallace-Kuhl & Associates, Inc.
500 Menlo Dr., Ste. 100
Rocklin, CA 95765

INTRODUCTION

This Erosion and Sediment Control ("winterization") Plan has been prepared by Wallace-Kuhl & Associates, Inc. (WKA) on behalf of Penryn Development, LLC to address excavation activities required for the removal of health risks posed by the presence of chemically impacted soil (derived from former pesticide application) at the Penryn Property located approximately one and one-half miles northeast of the central business district of the incorporated town of Loomis, California (site, project area or subject property). This document presents best management practices for erosion control during the proposed removal action.

SITE INVENTORY AND ANALYSIS

The proposed excavation areas, identified as Mitigation Areas 1, 2 and 3 (Figure 6 in RAW) are located within an area historically used for orchard cultivation and include several heavily vegetated drainage areas. The orchard trees have been completely removed, and no surface evidence remains of the former orchard. Paved access roads are present up to the vicinity of the site. Access to the excavation areas from the site perimeter is, for the most part, accessible over open unpaved ground.

The scope of work involves removing approximately 11,600 cubic yards of soil from an area of approximately 6.24 acres encompassing Mitigation Areas 1 through 3 as shown in Figure 6 of the RAW. Individual mitigation area measurements and volumes are included in Table 6 of the RAW. Proposed excavation depths will vary from 1.0 to 2.0- feet below ground surface (bgs). All three mitigation areas will grade downward from their respective perimeters - draining inward into the excavations. Backfilling will be completed in conjunction with larger site-grading plans currently under development for the proposed facility.

Natural grade drainage in the proposed excavation areas trends gently to the south. Sediment basin traps or other protective measures will be used in drainages present in the vicinity of proposed excavation areas.

CONTROL MEASURES

Erosion prevention and sediment control measures will include the following:

1. Stabilized construction entrance – site entry/egress is limited to one access road from Penryn Road located on the east adjacent side of the site. This site entrance will be lined with gravel to minimize tracking of soil onto the asphalt roadway. A truck

decontamination area will be maintained near the site entrance. Any rinse water generated will be collected and retained in drums or other container type(s) for analysis and proper disposal.

2. Fiber roll dikes or earthen berms will protect excavation areas and stockpiles where necessary to prevent run on, run off and erosion. Excavation areas will drain inward to prevent sediment escape. During construction, the contractor shall apply sufficient water to roadways, excavation and stockpile areas as necessary to prevent fugitive dust. The contractor may elect to apply a dust palliative in conformance with the provisions of Section 18 of the California Department Of Transportation *Standard Specifications*, July 1992.
3. Contractor will maintain an extra quantity of fiber rolls on-site and covered at all times.
4. Stockpiled soils will be kept within a designated area enclosed within fiber roll dikes and/or bermed areas. Stockpiled soils will be covered to prevent infiltration and washout.

WORK SCHEDULE

Site activity events will be scheduled in a fashion to enhance erosion control measures. The site activity will proceed as follows:

1. Prior to start of excavation erosion control measures will be in place.
2. Vegetation will be cleared. Additional erosion control measures may be added.
3. Site coordinator will call to schedule inspection.
4. Maintenance will be performed throughout the duration of the project estimated as approximately 30 days.
5. Where required, erosion and sediment control measures will remain in place until further planned site grading activities begin.
6. Backfill activities will be conducted in conjunction with the following phase of site grading activities.

PROJECT CONTACTS

WKA Project Manager	Bill Flores (916) 435-9722 Office.
WKA On-Site Coordinator	Matt Taylor (916) 997-7099 Cell
Subcontractors	To be determined